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final environmental impact statement

N. C. Department of Natural Resources
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Division of Parks and Recreation

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SUMMARY

FINAL ENVIRONMENTAL IMPACT STATEMENT

MASTER PLAN IMPLEMENTATION

JOCKEY'S RIDGE STATE PARK

DARE COUNTY, NORTH CAROLINA

[ ] Draft Environmental Impact Statement

[x] Final Environmental Impact Statement

RESPONSIBLE OFFICE: N.C. Department
Natural Resources and Community Development
Division of Parks and Recreation
P.O. Box 27687
Raleigh, North Carolina 27611

1. NAME OF ACTION: [x] Administrative

[ ] Legislative

2. DESCRIPTION OF ACTION: The Division of Parks and Recreation proposes to implement the master plan for Jockey's Ridge State Park, Dare County, North Carolina. The primary objective of the plan is to provide a development plan and program compatible with the nature of the site. The Ridge will be left in its present state, a free-moving sand dune. Public access and bicycle traffic on the U.S. 158 Bypass will be provided at the Old Vista Harbour entrance. Proposed recreation facilities and opportunities include: parking for 150 cars, undirected hiking, picnicking, a visitor center, interpretation, and hang gliding and model plane soaring.

3a. ENVIRONMENTAL IMPACTS: The project will produce numerous direct recreation benefits by protecting Jockey's Ridge from further development and by providing safe public access for park visitors. In contrast to many N.C. State Park master plans, the conservative amount of development proposed at Jockey's Ridge allows the realization of numerous recreation benefits at a very low environmental cost.

3b. ADVERSE ENVIRONMENTAL IMPACTS: The primary significant unavoidable adverse environmental impacts will include: the removal of 0.82 hectares (2.04 acres) of pine-hardwood community vegetation, changes in soil chemistry, changes in sand movement patterns, and add valorem tax losses to Dare County, and the removal of miniature golf opportunities in this immediate area.

4. ALTERNATIVES: This Environmental Impact Statement concurs with the Department and Division determination that the Jockey's

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Ridge State Park Master PLan combines the best (environmentally and recreationally) components of several alternatives considered and produces the most benefits per unit of environmental cost.

-PREFACE-

This Final Environmental Impact Statement has been prepared for the proposed future development of Jockey's Ridge State Park.

Due to time restraints, continued dissatisfaction with the matrix method of environmental impact quantification, the unique environmental nature of Jockey's Ridge, and the small amount of proposed development at the park, the organization and analysis procedure of this impact statement varies widely from that of earlier impact statements prepared for the N.C. Department of Natural Resources and Community Development, Division of Parks and Recreation.

To reiterate what I discussed in the preface to the Environmental Impact Statement for the South Fork New River Scenic River Study:

> "In the past, Environmental Impact Statements prepared for the Division of Parks and Recreation have not realized maximum utilization upon completion and approval. SEPA requires the preparation of an Environmental Impact Statement, but does not really require its usage after completion. In many units of the N.C. State Park System, the master plan and Environmental Impact Statement represent the first collation of data for a given park. Comprehensive master plans and environmental impact statements can, and should be used by park planners, park superintendents and rangers, technologists, etc., as a solid data base for a continuing program of park planning, development, management and interpretation.
>
> Furthermore, during Environmental Impact Statement review procedures, comments are often received from environmental specialists concerning data deficiences and misinterpretations. It would seem logical, therefore, that these specialists take the first initiative in the creation of a dynamic and constantly growing data base for a given park, either in an official format (such as comments and data additions to the draft Environmental Impact Statement) or in a non-official format (such as data provision to the Division of Parks and Recreation or to a given park).
>
> The more that is known about the cultural, biological, hydrological, ecological, economic, recreational, etc., environments of a given State Park, the smaller the overall intential adverse environmental impact will be resulting from park development and utilization.
>
> We welcome all comments and data additions to this final environmental impact statement."
>
> Richard B. Hazard

N.C. Department of Natural Resources and Community Development
Master Planning Unit
P.O. Box 27687
Raleigh, N.C. 27611

This (final) Environmental Impact Statement has been prepared entirely in metric. Where applicable, the reader will find the English equivalent of the metric conversion in parenthesis following the conversion. The following conversions were used:

ENGLISH	METRIC
1 Inch	2.34 Centimeters
1 Foot	0.3048 Meters
1 Yard	0.9194 Meters
1 Mile	1.609 Kilometers
1 Acre	0.4047 Hectares
1 Square Mile	259 Hectares
1 Gallon	3.7855 Liters

Cover Prepared by Carolyn Van Hoy and Richard B. Hazard

Text Prepared by Richard B. Hazard

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Clearinghouse Review - April 19, 1978
Final to Clearinghouse - June 8, 1979

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Section II. - The Environment, and Subsequent Impacts
- A. Air
  - 1. Air Resources
  - 2. Impact of Proposed Facilities on Air Resources
    - a. Interim Facilities
    - b. Phase I facilities
    - c. Phase II facilities
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etc.)


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INTRODUCTION

Jockey's Ridge State Park, aptly named for the highest sand dune in the Eastern United States, is located in the northeast corner of Dare County on Bodie Island (also known as part of the North Carolina Outer Banks). Consisting presently of 107.7 hectares (266 acres) of active dune systems, the park is characterized by numerous dunes, sandy soils, small pockets of coastal vegetation, and increasing outdoor recreational use.

The history of Jockey's Ridge spans four centuries, and includes habitation by the Algonquin Indians, sightings by Spanish and French explorers, and 19th and 20th Century resort communities (some say that early horse races along the lower slopes of the Ridge account for its name). Halted numerous times by war and depression, the rapidly increasing resort oriented residential and commercial development of the area has reached phenomenal levels in the past few years.

Residential development that was encroaching on Jockey's Ridge was halted by Carolista Baum and People to Preserve Jockey's Ridge during the summer of 1973. Their concerted efforts led to the acceptance of a park feasibility report prepared by the N.C. Department of Conservation and Development Parks and Recreation Committee in October of 1973.

By this time, the U.S. Department of the Interior approved the Dune for inclusion in the National Registry of Natural Landmarks, with favorable recommendations by the N.C. Department of Natural and Economic Resources and strong public and private group support, the 1975 N.C. General Assembly appropriated $500,000 for the specific purpose of acquiring land at Jockey's Ridge. [please note: Through the years, the

N.C. institution containing State Parks has changed names from the N.C. Department of Conservation and Development to the Department of Natural and Economic Resources to the Department of Natural Resources and Community Development].

With this appropriation, and matching funds from the USDI Bureau of Outdoor Recreation, the State of North Carolina began purchasing property (approximately 61.5 hectares or 152 acres in the beginning). In addition, the Nature Conservancy purchased property north of the Dune, and dedicated it to the State for the original purchase price. Presently, 107.7 hectares (266 acres) of Jockey's Ridge region are owned by the State, and approximately 64.8 hectares (160 acres) are needed to complete the original 1973 proposal.

SECTION I. - THE MASTER PLAN
A. REGIONAL RECREATION SUPPLY AND DEMAND

One of the early processes undertaken during master planning activities for Jockey's Ridge State Park entailed the thorough analysis of the regional recreation situation in order to formulate a recreation program for the park.

Nags Head and Kill Devil Hills contain over 32 kilometers (20 miles) of sandy ocean beach and nearly 16 kilometers (10 miles) of coastline along Roanoke Sound. The area, Roanoke and Bodie Islands, serves as the entrance to the Cape Hatteras National Seashore which extends 80 kilometers (50 miles) south of the Pamlico Sound. Through the years, Nags Head and Kill Devil Hills have traditionally been family resorts, however, more and more facilities and accommodations are being provided for the general vacationing public. Bodie Island is reached via U.S. 64 and U.S. 264 from the west and U.S. 158 from the north. Daily highway counts average 5,000 vehicles on U.S. 158 and the bypass. However, they do not reflect the high seasonal visitation figures during the summer months of June, July, and August. During this summer season, 90 percent of the tourists surveyed at Nags Head traveled 161 kilometers (100 miles) or more to vacation there. Over 12 percent came from parts of Virginia, and smaller percentages came from South Carolina, Kentucky, Tennessee, and New Jersey.

By far, the most popular activities on the coast are swimming, fishing, boating, camping and visiting scenic attractions. To accommodate these uses, 70 percent of all urban land uses in Nags Head have developed into motel, hotel, and other commercial and residential land uses. The commercial developments are primarily tourist oriented with restaurants, gift shops, entertainment facilities and gasoline stations. Eight fishing

piers and three marinas have been developed, and eight other public boat ramps exist within a one-hour drive of Nags Head. Overnight camping facilities are readily available on Roanoke and Bodie Island. Approximately 1,800 campsites have been developed by private sources for public use. An additional 700 campsites are provided in the Cape Hatteras National Seashore on Hatteras and Ocracoke Islands. Other recreational facilities in the area include four 18-hole golf courses, three miniature golf courses, and two amusement parks.

The Federal Government has taken a leading role in preserving the seashore and in providing recreational facilities. In addition to managing Hatteras and Ocracoke Island and providing 700 campsites, the National Park Service manages the Pea Island National Wildlife Refuge, the Fort Raleigh National Historic Site, and Wright Brother's National Memorial.

A visitor center and formal garden are located at Fort Raleigh, and every summer the Roanoke Island local Historical Association presents Paul Green's symphonic drama, 'The Lost Colony' in the outdoor amphitheater. The play dramatizes the attempts to colonize Roanoke Island in 1587.

To commemorate the Wright Brothers, a museum and monument were built at the location of their 1903 flights. A replica of their aircraft is on display inside the museum, and the monument is located at the pinnacle of Kill Devil Hill. Yearly visitation averages 300,000 to 400,000, with the heaviest totals being registered in the summer months of June, July, and August.

Altogether, Cape Hatteras National Seashore attracts over two million visitors every year. Most of these travelers come from over 161 kilometers (100 miles away), and can be expected to stay in the area several days. Because of its location in Nags Head, Jockey's Ridge will receive heavy

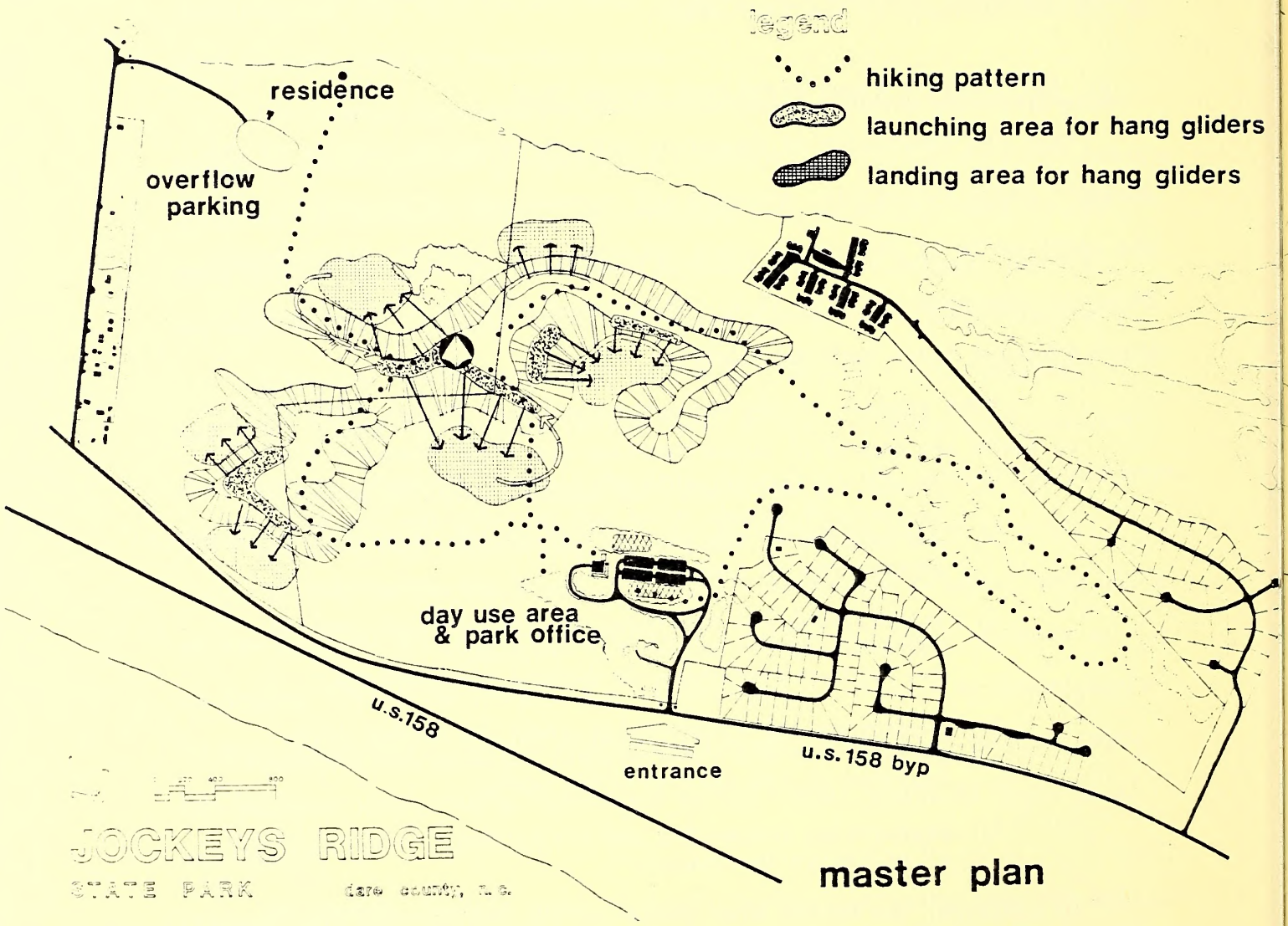
day use by vacationers. Uncounted numbers of people visit the Ridge now; and when convenient access and other facilities are provided, visitation should equal or exceed that of the Wright Brother's Memorial. On the average, the National Seashore's visitation increases from 10 to 15 percent every year. If this trend continues, Jockey's Ridge can expect approximately 400,000 visitors when full time operation begins and close to 500,000 visitors by the year 1980.

B. THE JOCKEY'S RIDGE STATE PARK MASTER PLAN

Upon the conclusion of intensive and comprehensive studies of the Jockey's Ridge biological, cultural and recreational environments, and the utilization of the public input obtained, the Jockey's Ridge Master Plan was completed in July, 1976. This Master Plan is based upon the North Carolina State Park Principles:

> "The purpose of the North Carolina Park System shall be to serve the people of North Carolina and their visitors by:
>
> 1. Preserving and protecting natural areas of unique or exceptional scenic value not only for the inspiration and benefit of the present generation, but, also for generations to come.
>
> 2. Establishing and operating state parks that provide recreational use of natural resources and outdoor recreation in natural surroundings.
>
> 3. Portraying and interpreting plant and animal life, geology, and all other natural features and processes included in the various state parks.
>
> 4. Preserving, protecting and portraying scientific sites of statewide importance."

In addition, the Master Plan speaks to the optimum carrying capacity of the site for all of its proposed activities and facilities with respect to the maintenance of the desired park character. It remains a flexible plan inasmuch as development need not reach its final phase if follow-up analysis indicates expansion is undesirable. The Jockey's Ridge State Park Master Plan advocates the following directives:


legend
hiking pattern
launching area for hang gliders
landing area for hang gliders
residence
overflow parking
day use area & park office
u.s.158
entrance
u.s.158 byp
JOCKEYS RIDGE
STATE PARK
dare county, n.c.
master plan

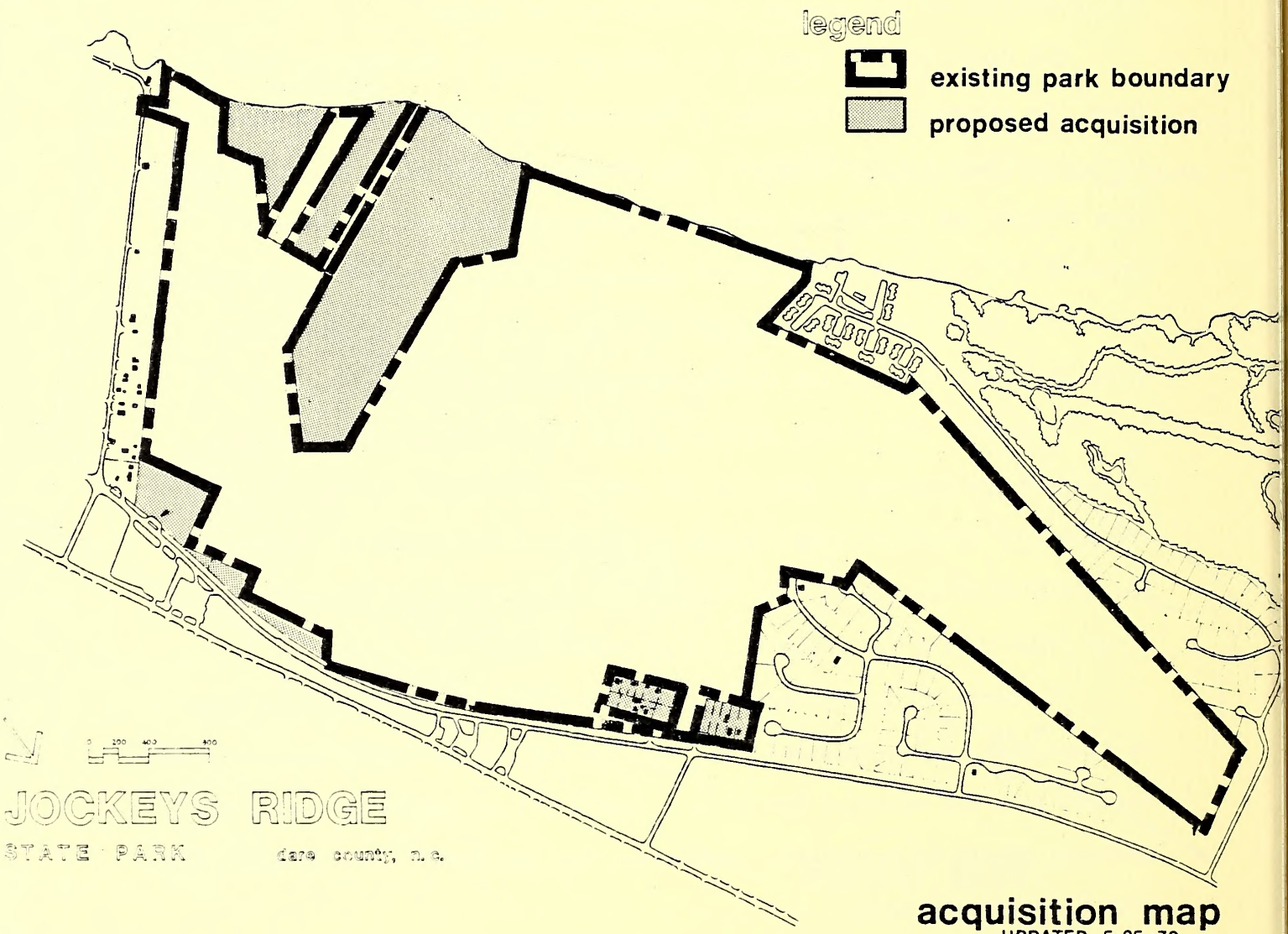
Protection of Jockey's Ridge from further development and providing safe public access for park visitors are the primary responsibilities of the Division of Parks and Recreation. In order to protect the ridges, the remaining portion of the main dune must be acquired. Approximately 64.8 hectares (160 acres) of the original 172 hectare (426 acre) proposal have yet to be purchased, and should be considered the minimum amount necessary for protection of the current boundaries of the Ridge.

The Ridge will be left in its present state, a free-moving sand dune. No attempts will be made to influence the movement of the dune or to stabilize different areas. The movement of the Ridge has generally been towards the southwest, and should continue; however, the rate of movement is still unknown. Aerial photographs taken in 1949, 1957, and 1974 have shown that parts of the Ridge have been moving in a northwesterly direction, thus slowing the rate of southwesterly movement.

To protect the visual quality of the Ridge, the miniature golf course and the hamburger stand at the corner of the U.S. 158 Bypass and the "Old Soundside Road" should be purchased and removed. In addition, the Division will request from Virginia Electric Power Co. (Vepco) that the power lines behind the Ridge be placed underground.

The homes along "Old Soundside Road" will not be purchased as long as they remain in residential use. If the land use or zoning classification changes from the existing SPD-20 to a commercial or industrial zone, the property should be purchased. Otherwise, the residential use is compatible with the adjacent park.

The inholdings south of the Old Vista Harbour Road are also included in the acquisition proposal. Two one-acre parcels have been subdivided into twelve pieces, and six one-story wooden frame residences are located on the property. Only one of the dwellings is in year-round use, and the



acquisition map

UPDATED 5-25-79

other five are summer cottages. None of the homes are suitable for park use.

In order to provide a buffer from the neighboring North Ridge Estates Subdivision, the one-acre tract north of the Vista Harbour Road should be purchased. This tract is subdivided into five lots with two permanent homes and one mobile trailer.

Public access for vehicular and bicycle traffic on the U.S. 158 Bypass will be provided at the Old Vista Harbour entrance. This will be the main park entrance and all park facilities will be located here. The shrub thicket immediately northeast of the main ridge will be the location for the parking lot and park office/maintenance area. The Old Vista Harbour Subdivision road will be retained to the parking area, but will be closed for traffic beyond this point. The road surface is presently in poor condition and will require either resurfacing or paving.

The intersection at the park entrance will also require modification if a continuous traffic flow on the bypass is to be maintained. Presently, the U.S. 158 Bypass is a two-lane highway with a speed limit of 55 mph, and a seasonal limit of 45 mph. If a turning lane for northbound traffic is not added, traffic will be periodically stopped. In addition, an entrance lane for southbound traffic and a reduction of the seasonal speed limit to 35 mph is recommended. Eventually the bypass will be widened to four lanes; however, this project has not been included in the North Carolina Division of Highway's seven year capital improvements program.

If the parking area and entrance were developed this year, Jockey's Ridge State Park could expect from 300,000 to 400,000 visitors. During the three summer months of June, July and August, over one-half of the park visitors will be received (approximately 200,000). Visitation records kept

by the National Park Service for the National Seashore, indicate that visitation of Wright Brother's Memorial has increased on the average 10 to 15 percent yearly since 1970. If this annual increase is used to project future use, the park will receive approximately 500,000 visitors by the year 1981.

Hiking to the summit of Jockey's Ridge has always been the favorite recreational activity, and will probably remain so. Children and adults enjoy climbing and playing on this huge pile of sand. Once at the peak, the surrounding panorama is very scenic and effectively illustrates the fragile nature of the Outer Banks.

Visitors require approximately one hour to hike to the summit of the Ridge, view the area, and return to the roadside parking lot. The intense summer heat and blowing sand usually deter visitors from staying longer. For these reasons, a high-turnover day use program is being planned for the park.

Using the projected visitation figures, the park can expect approximately 750 vehicles per day or 2600 visitors during an average day in the summer. For a short term recreational area such as Jockey's Ridge approximately eight turnovers per day can be expected. Initially, 100 parking spaces will be required, and by 1981, 50 more spaces will be needed. At that time, the projected growth rate of 10 percent should be evaluated.

A bike rack will be provided in the parking area to accommodate cyclists. Dare County in conjunction with the National Park Service has plans for an extensive bike route system that would include Jockey's Ridge. The park will be a major destination point along the route.

The park office and maintenance area will be combined in one building for convenience, and shall be located immediately south of the parking lot. This office will be the main visitor and administrative center for all park affairs. Use permits, public information and other public requests will be handled through this office. Approximately 69.7 square meters (750 square feet) of space will be required for office, storage, and sanitary facilities.

Storage space for park supplies, equipment, and vehicles along with a workshop for minor repair and park construction will be provided in the building. An additional 92.9 square meters (1000 square feet) will be required for these maintenance functions.

The park office/maintenance area and parking lot are located in an area that has been stabilized by a shrub thicket. The elevation above sea level is 2.7 meters to 3.1 meters (9-10 feet), which is just above the 100-year flood level. Of course, the site is susceptible to inundation during a severe tropical storm, as is the remainder of Bodie Island.

The nature of shifting sand prevents construction of traditional trails in the park. For this reason, the Ridge will be in visual contact with the park office and parking lot. The visitors will be allowed to choose their route to the Ridge and to hike to any part of park property. Public information, and park rules and regulations will be available at the office and on free-standing interpretive exhibits. The unique character and significance, the physical and cultural history, and movement of the Ridge will all be described and illustrated within these free standing, all-weather exhibit cases.

To satisfy the need for public sanitary facilities for park visitors, a combination toilet building and shelter is proposed adjacent

to the parking lot. A facility with four water closets and four lavoratories for females, and two urinals, three water closets and four lavoratories for men should be considered the optimum design. The shelter should include sufficient space for four 1.6 x 2.4 meter (6 x 8 feet) picnic tables, (approximately 56 square meters - 6000 square feet) and a small area for self-service machines.

Because of the high projected turnover rate, only 20 percent of the park visitors will be provided with picnic facilities. Additional tables will be located adjacent to the toilet building, and will have a protective wooden shelter. Each shelter will accommodate two tables and will be oriented to protect the visitor from the sun and blowing sand. Altogether, 20 tables are proposed, and if visitation increases as expected, 10 more tables will be needed within five years.

Hang Gliding: Two additional recreational activities, hang gliding and model plane soaring, are being proposed on a conditional status. The Ridge is an ideal land form for hang gliding and model soaring, and is not harmed in any way by the pedestrian traffic generated by pilots or spectators. The principle conflict occurs between landing hang gliders and hikers. For this reason, hang gliders will be restricted to specific slopes on the Ridge, and each pilot will have to substantiate his flying ability to the satisfaction of the park superintendent. Supervision of all hang gliding activities shall be the direct responsibility of the park superintendent, and he shall have the discretionary power to interpret State Park rules and regulations. On a yearly basis, an evaluation of park practices shall be done in order to modify the recreation program or park regulation.

A hang gliding service for glider rentals and flying lessons is incorporated in the recreation program. The Ridge offers an excellent

opportunity for beginning hang glider pilots to attain flight experience without fear of serious injury. The service will be under the direct supervision of the North Carolina Division of Parks and Recreation, and the Park Superintendent shall be the Division's official representative at the Park. Management of the service can be accomplished by either private concessionaire or by State Parks. In either case, the administrative and management facility for the service will be located adjacent to the park office, and additional parking spaces are included in the previous parking proposal.

Hang gliding is a popular sport, and special events such as the National Tactile Flight Championships sponsored by the Outer Banks Chamber of Commerce should be included in the park recreational program. This event occurs yearly and attracts the best hang glider pilots on the eastern coast of the United States. Temporary overflow parking for 200-300 vehicles can easily be provided in the depression on the south side of the Ridge. The high water table prevents this site from being a permanent location for a parking lot; however, the area is suitable for limited use once or twice a year.

Model plane soaring poses no real threat to other park activities. All planes are launched from the peak of the Ridge, and attain a minimum altitude of 15 meters (50 feet). The radio controlled planes can be landed anywhere the pilot wishes, so the risk of injury from a model plane is remote. At Jockey's Ridge model pilots usually 'fly' individually or with a small group of three to four people. They do not attract large numbers of spectators, and since only two clubs are within 483 kilometers (300 miles) of the site, the demand placed on the Ridge from model soaring pilots is minimal. The variable nature of the winds also prevents enthusiasts from traveling long distance to 'fly' here, and therefore it is not a popular site for model soaring contests.

A Visitor Center designed to accommodate the heavy seasonal visitation experienced on the Outer Banks is being proposed for Jockey's Ridge. A facility of this type could be used to expand the nature interpretation program of the Ridge, and to advertise other State Parks in the system. The interpretive program would focus on the unique character and moving nature of Jockey's Ridge. A system using wind monitoring devices and aerial photography can be devised to map the Ridge's movement, and the information could then be exhibited in the center. Wind monitoring stations can be placed at strategic sites around the Ridge to acquire accurate wind speed and directional data.

The visitor center shall orient and provide public information for the park visitor. Space shall be allocated for the naturalist's office and laboratory, exhibits (92.9 square meters - 1000 square feet), auditorium storage, and restrooms. The exhibit hall will consist of exhibits, electronic equipment, and interior structures for the exhibits. The displays shall address geological history, cultural history, dune floristics, and dune movement patterns. The auditorium shall seat a maximum of 75 visitors, and provide an audio-visual system for orientation programs. Furnishings shall include folding chairs, a rear projection screen, slide projectors, and sound equipment. The space can also serve as a local meeting and seminar facility for the community.

The visitor center will be located in the same area as the park office/maintenance complex, and all visitors will use the proposed parking lot previously described. Fifty additional parking spaces should be provided along with the visitor center's construction.

Two park residences will eventually be developed on park property. The first residence shall be located east of the maintenance area and shall be the permanent year round home for the park superintendent. The other residence will be located on the backside of the Ridge. The superintendent's

chief assistant, a Ranger II, shall occupy this residence, and he shall be responsible for monitoring illegal access from the Old Soundside Road to the temporary overflow parking area. Presently, the Midgett house is in the general location that would be ideal for a residence, however, it will not be developed until an equitable agreement has been reached with the family.

Services to Park Users: Jockey's Ridge State Park is unlike most of the other State Parks for a variety of reasons. It is an entirely unique feature, a living dune system, existing on a very compact piece of land; it is very open in character, being wind swept and moved at the whim of the winds. It is imperative that the services to be provided for protection of both the park users and the resource itself be responsive to the situation and circumstances existing there. As at other parks, the legal authority vested in park personnel is an effective means of controlling activities and preventing misuse of the park.

The park personnel should systematically patrol the land owned by the State in order to educate the public to park philosophy and regulations. This program should be closely coordinated with the local law enforcement agencies, and the help of these agencies should be actively pursued. This help will definitely be needed during the time that only interim facilities are provided at the site, but will also be desirable after development of the recreation facilities.

In addition to direct contact by park personnel, an information program should be designed to help orient and educate the park users. A series of booklets or pamphlets explaining the origin of the Outer Banks, the development of Jockey's Ridge, and the natural forces at work on the dune system could be used to instill in the park visitor

an awareness of the fragile yet yielding nature of the Ridge and its supporting dune system. If the public understood the reasons that allow Jockey's Ridge to exist and can see the way that man fits into the overall scheme of things, that understanding will go a long way toward helping protect the natural feature.

Visitors should also be well-oriented to the location of park facilities and to the routes of access to the top of the Ridge that do not interfere with other users of the park. An access system will be established so that as little conflict as possible between hikers and other users, such as hang gliders, will occur. Ability to wander over the dune will not be hindered, but it must be understood that all of the various users of the dune must not hinder each other's rights to use the feature. The access system will be based, more or less, on common sense and courtesy, and all park visitors will be expected to abide by these rules.

PARK MANAGEMENT

In order to protect the park and manage the recreational activities, only one full-time park entrance will be provided. Other entrances will remain closed to the public except when special activities are planned, or when demand for parking spaces exceeds those available. The parking along the U.S. 158 Bypass will be removed, and a 24-hour parking lot will be provided on the park property. Arrangements will be made with the Town of Nags Head Police Department to allow them to patrol this parking area as part of their regular patrolling duties, and they will retain authority to issue citations to anyone parking illegally either in the parking area or along the U.S. 158 Bypass. This cooperation between the State and Town of Nags Head is essential to protect all owner's property rights and continue freedom of access at all times to Jockey's Ridge. Climbing the dune at all

times would be allowed as long as no problems arise; but, for example, if surrounding property owners sustain damages, the policy would need to be re-evaluated.

Maintenance of the Park is essential for upkeep of the facilities and ensuring that trash and litter do not spoil the scenery around the dune for park visitors. The physical appearance and condition of the park can greatly influence the park visitor's attitude while he is in the Park. Therefore, the maintenance area will be in close proximity to the major use areas in the Park. Storage space for park supplies, equipment, and vehicles, along with a workshop for minor machinery repair and park construction will be provided in the maintenance building, which will either be a part of, or will be very close to the park office.

During the time that interim facilities are provided at the Park, the staff will be limited to a seasonal Ranger II, 2 seasonal Park Attendants, a part-time secretary, and whatever labor support is needed. When the Park office and maintenance areas are built, the existing park staff will expand to include a Superintendent and seasonal Park Naturalist in addition to the staff already present, which will be made permanent full-time. In the event that facilities are expanded to include a visitor center and museum, at least one additional Ranger position will be needed to handle increased work loads.

In addition to the normal park duties, the staff will be responsible for management and control of two activities which have not been normally associated with State Parks until this time. These activities are hang gliding and model airplane soaring, both of which have become popular at Jockey's Ridge. In order to ensure that users of the Park do not interfere with other visitors, a program allowing certain control of all activities will be implemented.

INTERIM FACILITIES

During the time that preceeds construction of permanent facilities, the ability to control the site and provide maintenance services will be necessary. The interim facilities will be located in the same area that will be used for the permanent park office and other related services; the shrub thicket northeast of the main dune will be the site used for this purpose.

One of the first actions to be accomplished in the interim phase will be the removal of the linear parking lane across the western side of the U.S. 158 Bypass and construction of a parking lot on State-owned land inside the Park boundary. This parking lot will provide space for 100 cars, and will be the first of two similar size parking bays to be ultimately provided. Access to this parking lot will be by the Vista Harbour Road. This road will be resurfaced as needed to handle the increased traffic load, as will the parking area it serves.

A temporary park office will be rented in close proximity to the Park (Nags Head zoning regulations prohibit the customary State Park interim park office mobile trailer). This office will be used until a permanent park office is built near the parking lot.

During the interim period, a total of approximately 2000 people per day should visit the Park during the summer months. In order to adequately serve this many people, the toilet building and shelter will be constructed in the same general area as the parking lot. Four water closets and four lavoratories for females, and two urinals, three water closets, and four lavoratories for males and 56 square meter (600 square feet) of covered shelter will be provided in the building. It will be sited to take advantage of the views of the Ridge, and a vegetation buffer will be used to screen the area from the Bypass and

North Ridge Estates.

Only two park gates will be needed to control the area. The first gate will close that section of the Vista Harbour Road that runs behind the Ridge. The parking lot will be left open 24 hours a day, and surveillance during the late evening and early morning hours will be provided by the Police Department of Nags Head. The other gate will stop illegal entry from the Soundside Road behind the Ridge.

One park entrance sign will be needed at the intersection with U.S. 158 Bypass. In addition, State Highway signs identifying the park should be placed at 1.6,8, and 16 km (1,5,10 mile) increments from the Park along all major highways, U.S. 158, U.S. 158 Bypass, and U.S. 64/264. A seasonal speed limit of 35 mph should be designated along the length of the Park during the summer months of June, July, and August. The remainder of the year, the limit should be 45 mph.

The interpretive program will consist of three free-standing, exhibit cases that will be placed at convenient locations in the park. Park rules and regulations, maps, and natural and cultural information will be exhibited.

Virginia Electric and Power Company will be requested to place their transmission lines underground. The overhead power line runs the length of the park, and its removal from sight would make a substantial improvement to the scenic quality of the Park.

For ease of analysis in the next section, the master plan can be divided into the folloiwng three development phases:

INTERIM

* Resurface entrance road
* Parking lot for 100 vehicles, and one rack for ten bicycles
* Rent park office near the Park
* A water meter and 61 meters (200 feet) of water line to connect

to the city water supply. Septic tank and tile drain field, 366 meters (1200 feet) of underground telephone and electrical line.

* Combination toilet building/rest shelter. One drinking fountain with 61 meters (200 feet) of water line and 61 meters (200 feet) of electrical line.
* Three free-standing interpretive exhibits
* One State Park entrance sign and two gates.

PHASE I

* Repave park entrance road
* Permanent park office/maintenance building.
* Building for Hang Gliding Concession with underground electrical and telephone lines.
* Permanent Park Residence in the Day Use Area with 30 meters (100 feet) of gravel driveway, 30 meters (100 feet) of water line, with underground electrical and telephone lines.
* Eight wooden picnic shelters, 16 picnic tables, 4 trash receptacles.

PHASE II

* Add 50 parking spaces to existing lot
* Park residence on soundside of Ridge.
* Five wooden picnic shelters, 10 picnic tables, 2 trash receptacles.
* Park visitor center with electrical and telephone services, and septic tank and tile field.

Matrix showing those proposed actions that will have negligible if any impact, indicated by an 'X'

ENVIRONMENTAL COMPONENTS

	Access	Air	Hydrology	Soils	Flora	Fauna	Ecosystems	Historical	Wilderness	Scenic	Public	Discrimination	Conservation	Land use	Recreation
INTERIM															
Resurface entrance road				x	x			x	x	x				x	
Parking lot 100 cars								x							
Bikerack		x	x	x	x	x	x	x	x	x			x	x	
Vehicle shelter	x	x						x			x	x			
Storage building	x	x						x			x	x			
Water line	x	x	x		x			x	x	x				x	
Septic tank absorption field	x	x			x			x	x	x				x	
Utility lines	x	x	x		x			x	x	x				x	
Toilet building-rest shelter	x	x						x							
Water line	x	x			x			x	x	x				x	
Electric line	x	x	x		x			x	x	x				x	
Interpretive exhibits	x	x	x	x	x	x	x		x			x	x	x	
Park sign and gates		x	x	x	x	x	x	x							
PHASE I															
Repave park road				x	x	x	x	x	x	x				x	
Park office/ maintenance bldg.	x	x						x							
Water line	x	x			x			x	x	x			x		
Septic tank absorption field	x	x						x	x	x				x	
Concession building	x	x						x				x			
	x	x						x	x	x				x	
Park residence	x				x			x			x	x			x
Driveway	x	x						x			x	x			x
Water line	x	x			x			x	x	x			x		
Utility lines	x	x	x		x			x	x	x				x	
Picnic shelters	x	x	x					x					x	x	
Picnic tables & trash receptacles	x	x	x		x	x	x	x	x	x			x	x	
PHASE II															
50 spaces to parking lot							x								
Park residence	x				x			x			x	x			x
Utility lines	x	x	x		x			x	x	x				x	
Picnic shelters	x	x	x					x					x	x	
Picnic tables & trash receptac	x	x	x		x	x	x	x	x	x			x	x	
Visitor center	x	x						x							
Utilities	x	x	x		x			x	x	x				x	
Water line	x	x			x			x	x	x			x		
Underground placement of existing utilities	x	x	x		x			x			x	x	x		

* The use of "x" is intended as a location identifier, not as a quantifier.

SECTION II - THE ENVIRONMENT, AND SUBSEQUENT IMPACTS

As was indicated in the Table of Contents and the Introduction, the environmental impact analysis methodology is considerably different from that of previous Division of Parks and Recreation Environmental Impact Statements. The methodology of this statement is as follows:

In order to prevent one of the major duplications of information, the description of various components of the environment is contained in the same section as the environmental impact of the proposed actions upon those environmental components. These components have been grouped into generalized categories, such as soils, vegetation, hydrology, etc. The proposed actions have been divided into the three development phases. Therefore, the information and impact analysis contained within Section II will be handled in the following sample format:

SAMPLE: A. Access

1. Written and graphic description of the access situation at Jockey's Ridge State Park.
2. Referral to the chart at the beginning of the section will identify those proposed actions that will have negligible if any impact on the various environmental components. The proposed actions that will have an impact (as illustrated by a blank in the chart) will be discussed in the following section.
3. Analysis of the environmental impact that the remaining proposed actions will have on the Access Situation, divided into the development phases.

EXAMPLE:

Interim

The resurfacing of the main entrance road

into the park will have the largest beneficial impact upon the Access Situation at Jockey's Ridge State Park. Being 305 meters (1000 feet) long, this road will.....

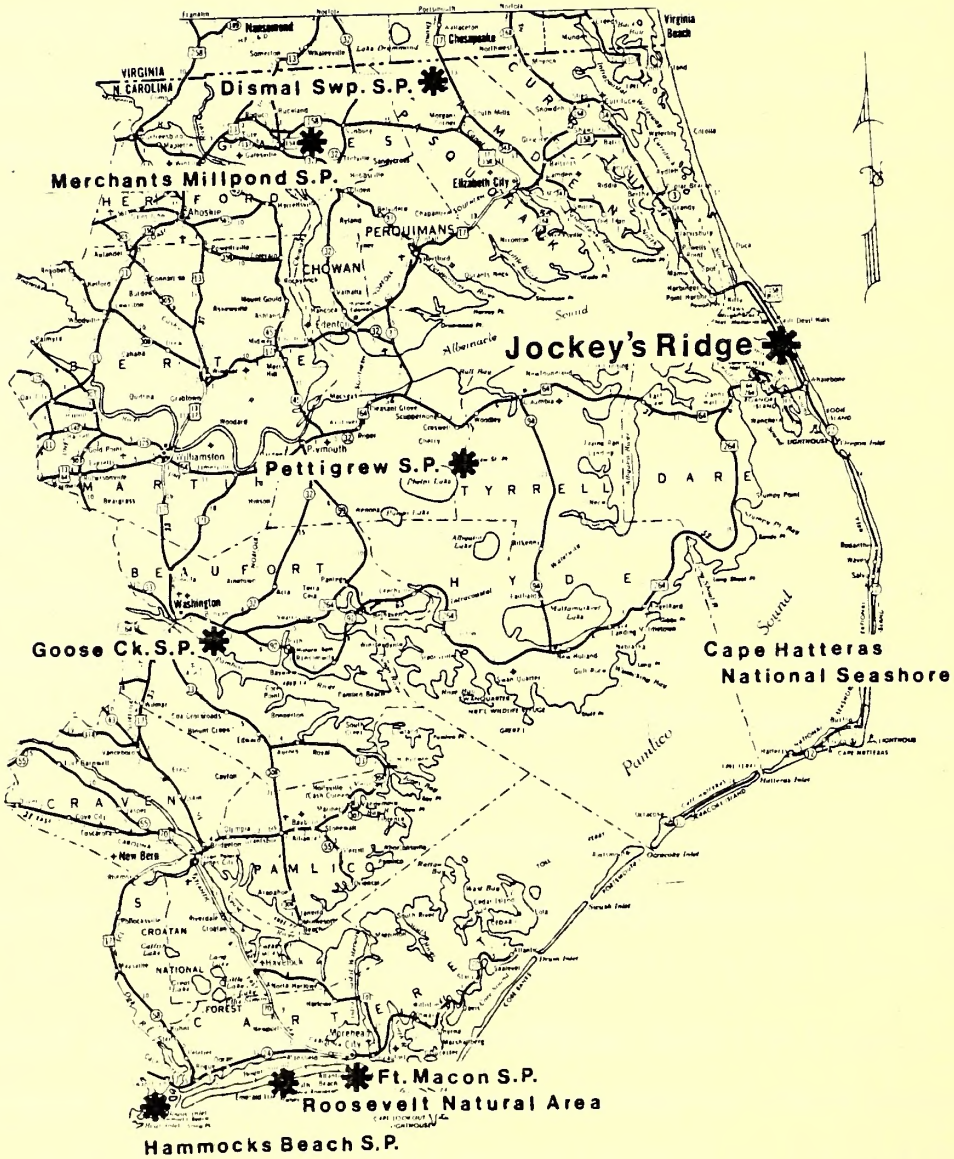
This method of impact analysis contains several significant advantages. First, the time consuming, little understood quantification matrix is eliminated. While the matrix aids the understanding of the magnitude of various impacts, it over generalizes the various components of proposed facilities impacts. Second, this new method in combination with a master plan of a developmentally conservative nature allows the thorough discussion of all proposed facility impacts, ranging from the small scale impacts (impact of trash receptables on flora resources) to large scale impacts (impact of septic tank absorption fields on ground water resources). Finally, through the combination of resource description and environmental impact into the same sections, much of the information duplication is eliminated, which ultimately will result in a shorter impact statement, which in turn would most likely encourage statement reviewers to read the <u>entire</u> statement.

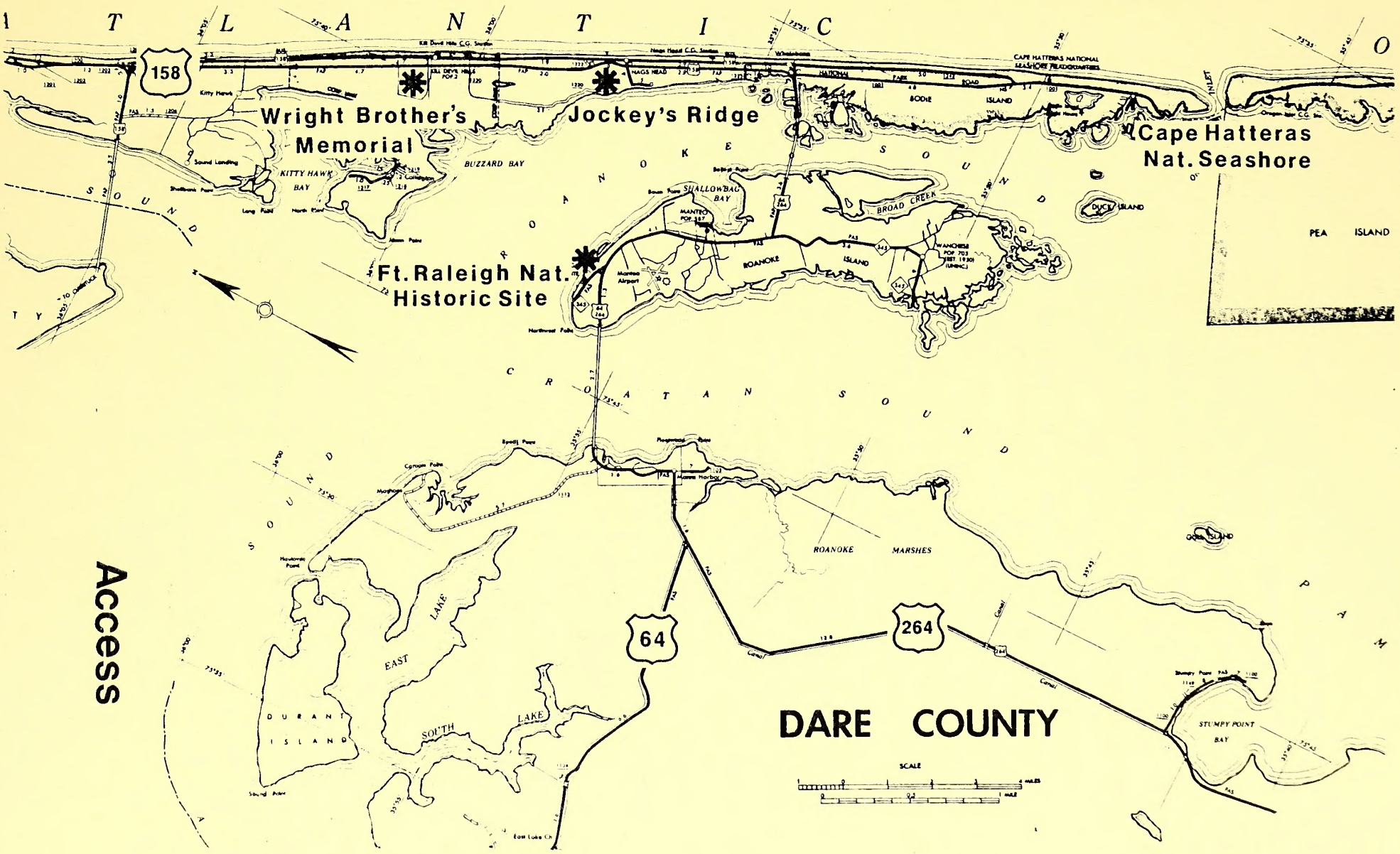
A. ACCESS

Please note the regional location and access maps on the following pages

As a result of bridge construction across Croatan Sound, Currituck Sound, Roanoke Sound, and the Alligator River, Bodie Island is readily accessible from the mainland via U.S. 64 and U.S. 264 from the west, and U.S. 158 from the north.

Regional Location




Wright Brother's Memorial
Jockey's Ridge
Cape Hatteras Nat. Seashore
Ft. Raleigh Nat. Historic Site
Access
DARE COUNTY
158
64
264
ROANOKE SOUND
CROATAN SOUND
ROANOKE MARSHES
DURANT ISLAND
EAST LAKE
SOUTH LAKE
BODIE ISLAND
ROANOKE ISLAND
PEA ISLAND
BUZZARD BAY
KITTY HAWK BAY
SHALLOWBAG BAY
BROAD CREEK
STUMPY POINT BAY
SCALE

Immediate access to Jockey's Ridge State Park is gained via the U.S. 158 Bypass, which provides access to the ocean side of the Dune. In the vicinity of the State Park, a 30-space roadside pull-off was built by the N.C. Department of Transportation for use by Jockey's Ridge visitors. During the summer months, this pull-off is usually completely full from early morning to late in the evening. This situation has created a severe problem in that the roadside parking area is the cause of many accidents during the summer months. Even with a seasonal speed limit of 45 mph, cars reduce their speeds far below the limit in order to pull into the parking area. Cars that do not stop, unconsciously slow down to take a quick glance at Jockey's Ridge. Exiting from the parking lot area is also very difficult. In several spots, the site distance required for the motorist trying to accelerate into traffic is insufficient. A 91-122 meter (300-400 foot) view of the highway is required for a 45-mph speed limit; and a view of approximately 30-46 meters (100-150 feet) is currently available.

IMPACT OF PROPOSED FACILITIES ON ACCESS

INTERIM FACILITIES

The repaving (resurfacing) and conversion of the Vista Harbour Road to the main park entrance road will produce substantial benefits to the transportation and access situation at Jockey's Ridge. In conjunction with the 100-car parking lot, this road will allow the removal of the existing hazardous U.S. 158 Bypass pull-off. Whereas people will continue to reduce their speed in order to view the Dune, the dangerous transportation congestion created by people pulling into, and out of the pull-off will be eliminated. Through the establishment of a well-screened entrance road and parking lot, the visual esthetics of

the area will be greatly improved. Also, much of the current degradation of neighboring properties caused by an insufficient parking area will be terminated.

The placement of bicycle racks in the parking lot will produce minute benefits to the access/transportation situation.

With the addition of a park sign and gates, much of the confusion as to where the park is will be eliminated. Furthermore, much of the unauthorized four-wheel vehicle utilization of the park will be terminated with the establishment of these facilities.

Of the proposed actions for Jockey's Ridge State Park, none can be construed to be detrimental to existing transportation systems within the immediate area.

PHASE I

The only phase I facility that will impact the access situation will be the repaving of the park entrance road. This will be a beneficial impact as discussed earlier.

B. AIR

There is a definite lack of air quality and noise level data for the Dare County region (due to the fact that the N.C. Department of Natural Resources and Community Development Division of Environmental Management Air Quality Section has no air quality monitoring stations in the area). The inland town of Elizabeth City, North Carolina is the area closest to Dare County which has a monitoring station. The following table indicates that none of the measurements have exceeded State standards in recent years:

PARAMETERS OF AIR QUALITY (ANNUAL MEANS IN ug/m^3)

Year	Suspended Particulates	Sulfur Dioxide	Nitrogen Dioxide
1972	43	5	20
1973	48	5	11
1974	43	5	12
State Standard	60[1]	60[2]	100[2]

Note: ug/m^3 = micrograms per cubic meter of ambient air

1 = geometric mean

2 = arithmetic mean

(Van Oesen, 1977)

Therefore, by extrapolation, it is assumed that air quality in the Dare County area is good to excellent. Areas immediately adjacent to the Atlantic Ocean have the benefit of nearly constant air movement due to land/ocean interactions which tend to favor good air quality.

In relation to noise levels, federal exterior noise levels for commercial activities are 75 decibels, for residential activities 70 decibels, and the federal interior standard for commercial and residential activities is 55 decibels. Noise levels in the region can be expected to be highest adjacent to major traffic corridors, and along the beach strand during times of heavy surf and storm conditions. There is no evidence that land noise levels have exceeded federal standards, and it is presumed, therefore, that local noise levels are within acceptable bounds.

(Van Oesen, 1977)

IMPACT OF THE PROPOSED FACILITIES ON AIR RESOURCES

INTERIM

During the resurfacing of the main park road, construction of the parking lot, and subsequent public utilization of both, there will be a short-term degradation of air quality, and short-term increase in noise levels. The overall impact on air resources will be negligible due to the obviously small additions of particulates, sulfur dioxide, nitrogen dioxide, and noise to the air; and to the nearly constant substantial air flow over the region.

PHASE I

The repaving of the park road, construction of a park residence, and the Phase II addition of 50 spaces to the parking lot and construction of another park residence will create similar impacts as the interim facilities, thus eliminating the need for duplication of information.

C. HYDROLOGICAL RESOURCES

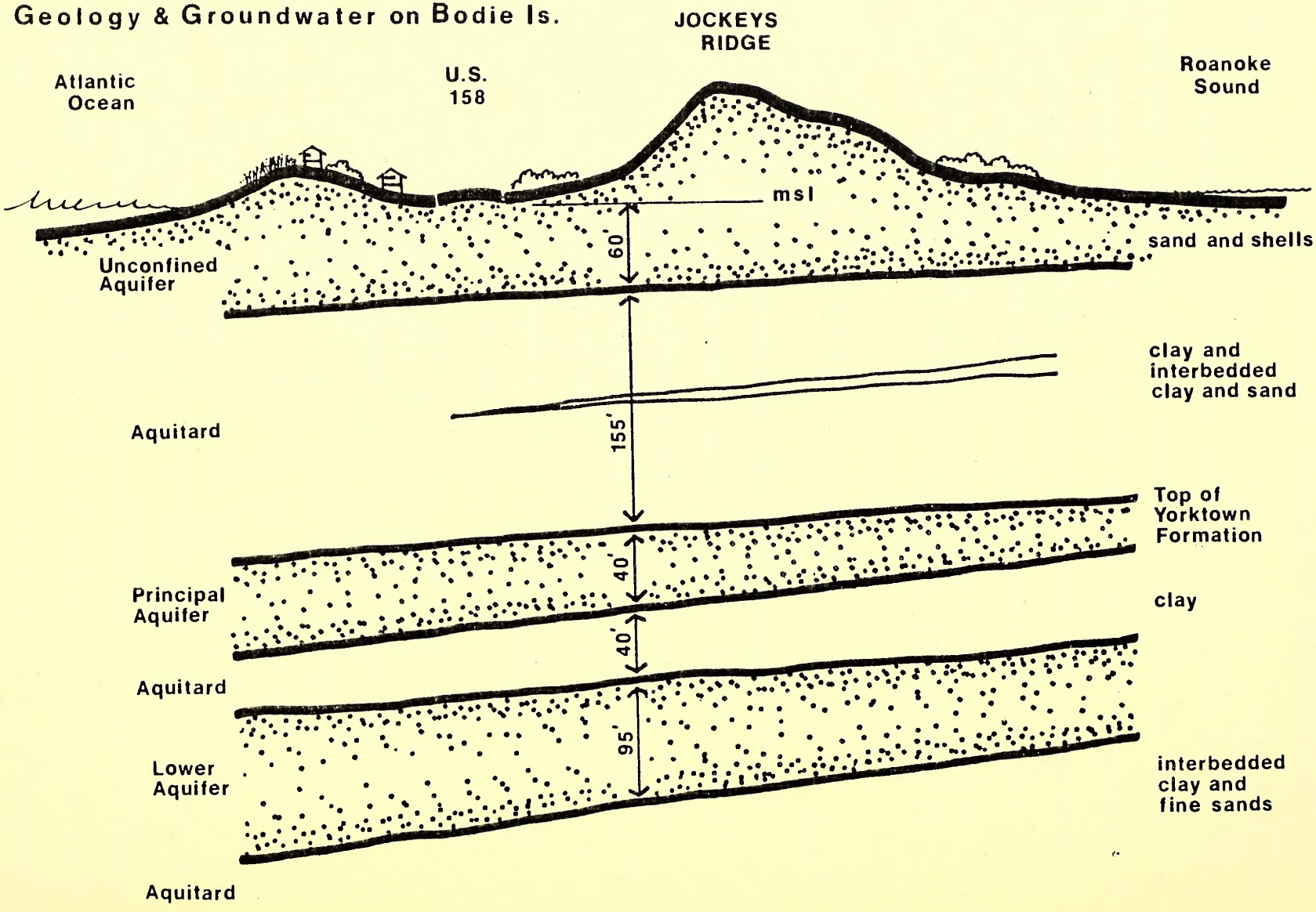
SURFACE WATER

The surface waters featured in this region include the tidal waters of Roanoke Sound, which forms the western boundary of the Park; the Atlantic Ocean, which is close enough to have a definite salt spray effect on the front line vegetation; and the numerous freshwater ponds which have a significant effect on the available domestic water supply.

Roanoke Sound is the body of water between Bodie Island and Roanoke Island, and spans the distance between Colington Island and the Oregon Inlet. This water, classified "SA" is suitable for fishing, wildlife propagation, bathing, recreation, and marketable shell fishing. The Atlantic Ocean, which forms the eastern boundary of Bodie Island, is classified "SB" (suitable for all uses except shell fishing close to the shore).

(N.C. DNER, Environmental Management Commission, 1976)

Geology & Groundwater on Bodie Is.



The freshwater lakes that occur in the nearby Nags Head Woods area are indicative of the high ground water table level on the Outer Banks. They exist in the depressions between the north-south oriented old dune systems, and are believed to be the products of wind-scooped depressions in this ancient dune system. The volume of the largest lake was measured at a time when the lake surface was at 2.9 meters (9.4 feet) above mean sea level and the average maximum depth of the lake was 4-6 meters (15 feet). At that time, the lake contained approximately 341 million liters (90 million gallons) of water, and the surface covered approximately 6.1 hectares (35 acres). The other unnamed fresh water lakes in this area are smaller but their aggregate water volume is sizeable. These lakes are apparently recharged by rainfall and by inflow from the upper aquifer.

A recent analysis of the largest lake indicated that the lake water is considerably lower in total dissolved solids, particularly iron, than water of the upper aquifer. This reservoir provides approximately 4.9 million liters (1.3 million gallons) of water per day. This water is classified as "A-II" which states the best usage of the water as a source of water supply for drinking, culinary, or food procession purposes, and any other best usage requiring waters of lower quality such as bathing, fishing, boating, wading, agriculture, industrial cooling and process water supply, fish survival and navigation).

(N.C. DNER, Environmental Management Commission, 1976)

As is indicated on the Elevation Study map on page 70, Jockey's Ridge State Park has been delineated into four different flood hazard groups by the U.S. Department of Housing and Urban Development. These groups are as follow:

Group	Elevation
10 year flood	Mean Sea Level to 1.98 meters (6.5 feet) above MSL
100 year flood	1.98-2.7 meters (6.5-9 feet) above MSL
500 year flood	2.7-6.1 meters (9-20 feet) above MSL
No Flood Danger	Above 6.1 meters (20 feet MSL)

One can note that the majority of the park lies within the first three flood frequency groups.

GROUND WATER

At Kitty Hawk, test wells penetrated three aquifers above a depth of 152 meters (500 feet). The uppermost unit is the water table, or unconfined aquifer consisting primarily of sand with some shells and some thin interbedded clays and salty sands. This aquifer extends from the land surface to a depth ranging from 9 meters (30 feet) below sea level at Manns Harbor to 18 meters (60 feet) at Kitty Hawk. This aquifer is the source of water for municipal wells at Manteo and many other domestic and commercial wells in the area. This aquifer may be a significant reservoir for recharge to the underlying acquifers in some areas of the region.

The top of the second, or principal aquifer ranges from 19.8 meters (65 feet) below sea level at Manns Harbor to 60.9 meters (200 feet) at Kitty Hawk. This aquifer consists of fine to coarse, but predominantly medium-grained sand with some shell fragments and some clay lenses. The upper part of the aquifer grades into clayey sands or clay, so that the aquifer at Nags Head is only about 13.7 meters (45 feet) thick.

The top of the lower confined aquifer ranges in depth from 73-91 meters (240-300 feet) below mean sea level, and in thickness from 27-46 meters (90-150 feet). This aquifer is a fine to medium grained sand with interbedded clays and some shells. This aquifer is not used as a source of water supply in the area.

The principal aquifer has been shown to be an extensive and productive source of water supply in the area. The water supply potential appears to be more than adequate to meet the needs of the area in the foreseeable future.

Due to the high degree of permeability of the aquifer in most of the area, it has largely been flushed of saline water. The confining beds above and below the aquifer provide good protection from vertical encroachment of saline water. Rainfall on the mainland is the source of recharge where the confining bed above the aquifer is absent, thin, or relatively permeable. The data indicates the major center of recharge is on the west side of Croatan Sound where the confining bed possibly terminates, and where the permeability and transmissivity of the aquifer are the best. From the recharge area the water moves beneath the sounds toward Roanoke Island and the beaches.

Impact of the Proposed Facilities on Hydrological Resources

Interim Facilities

Several of the proposed interim facilities will have an impact on regional hydrologic resources. Whereas the total impact will be insignificant, it must be noted. Through the development of a parking lot and toilet building, the total site specific amount of rainfall impervious surface will be increased. However, due to the lack of significant slopes

and highly permeable soils, the runoff created by these impermeable surfaces will not produce any significant impacts. During the construction of the parking lot, and resurfacing of the entrance road (and subsequent utilization) a certain quantity of new road oils and tars will be carried by surface runoff to nearby soils. The quantity of these foreign materials will be minimal, and these materials should be adequately filtered by the sandy soils prior to entrance of water into the water table.

The maximum quantity (interim plus phase I and II requirements) of domestic water supply required at the park is estimated at 126,436 liters per day (33,400 gallons per day). This water supply will be secured from the city's water line which parallels the Bypass. This water requirement will ultimately place a substantial burden on the Town of Nags' Head water systems.

Due to the potentially high adverse impact the interim and phase one septic tank absorption fields will have on hydrological resources, they will be discussed collectively at the end of this section.

PHASE I FACILITIES

The repaving of the park road, construction of the park office/ maintenance building and park residence, the phase III parking lot addition, and the construction of another park residence and the park visitor center will create similar impacts as previously discussed (additional impermeable surface, and introduction of road tars and oils into storm surface water) so as to preclude the necessity of additional discussion.

INTERIM AND PHASE I SEPTIC TANK ABSORPTION FIELDS

Of all the proposed facilities at Jockey's Ridge State Park, the septic tank absorption fields (one for the park office/ toilet building; and one for the park residence) pose the greatest threat to the maintenance of excellent hydrological resources quality.

Currently, Dare County is undergoing 201 planning facilities ("construction of the most logical, economical, socially acceptable and environmentally sound waste water transport treatment and disposal facilities"; Von Oesen, 1977). Some time in the future, high pressure and/or gravity sewage lines will pass near the park. At that time, the Park's effluent can be handled via this system. Due to the lack of large areas of suitable soils for effluent filtering, the construction of the visitor center and its corresponding sanitary systems will not take place until the development of the Dare County System (at which time all of the park's septic tank absorption fields (STAF) will be phased out.

The largest STAF will be located under the day use picnic area in an area of already cleared vegetation. This location, as identified by the Dare County Health Inspector, is the only area within this park region with proper soil characteristics and elevation to permit development of a large STAF. Located on Newhan-Corolla Complex Soils at an elevation of 2.7-3.1 meters (9-10 feet) above MSL, this field will be required to handle 18,928 liters (5,000 gallons) of effluent per day, and thus, will approach a size of 697 square meters (7,500 square feet). Room has been allocated to permit enlargement of the STAF as future needs dictate, and until the Park's System can be connected to the Dare County Complex System.

Although this STAF will be in <u>full</u> accordance to County and State regulations, it does introduce some potential adverse environmental impacts into the region. As is the problem in many coastal areas in the country, the minimal depth to the water table and the low filtering capacity of the very pervious sands place severe limitations for septic tank absorption fields. Ground water pollution, and upward movement of the effluent to the surface sands are the two major problems of coastal septic tank absorption fields. These impacts could very likely occur at Jockey's

Ridge State Park.

Developed solely as result of necessity, the Park's septic tank absorption fields performance must be constantly monitored. Furthermore, the most expeditious connection of the Park's sewage system to the Dare County System (when it becomes available) is recommended.

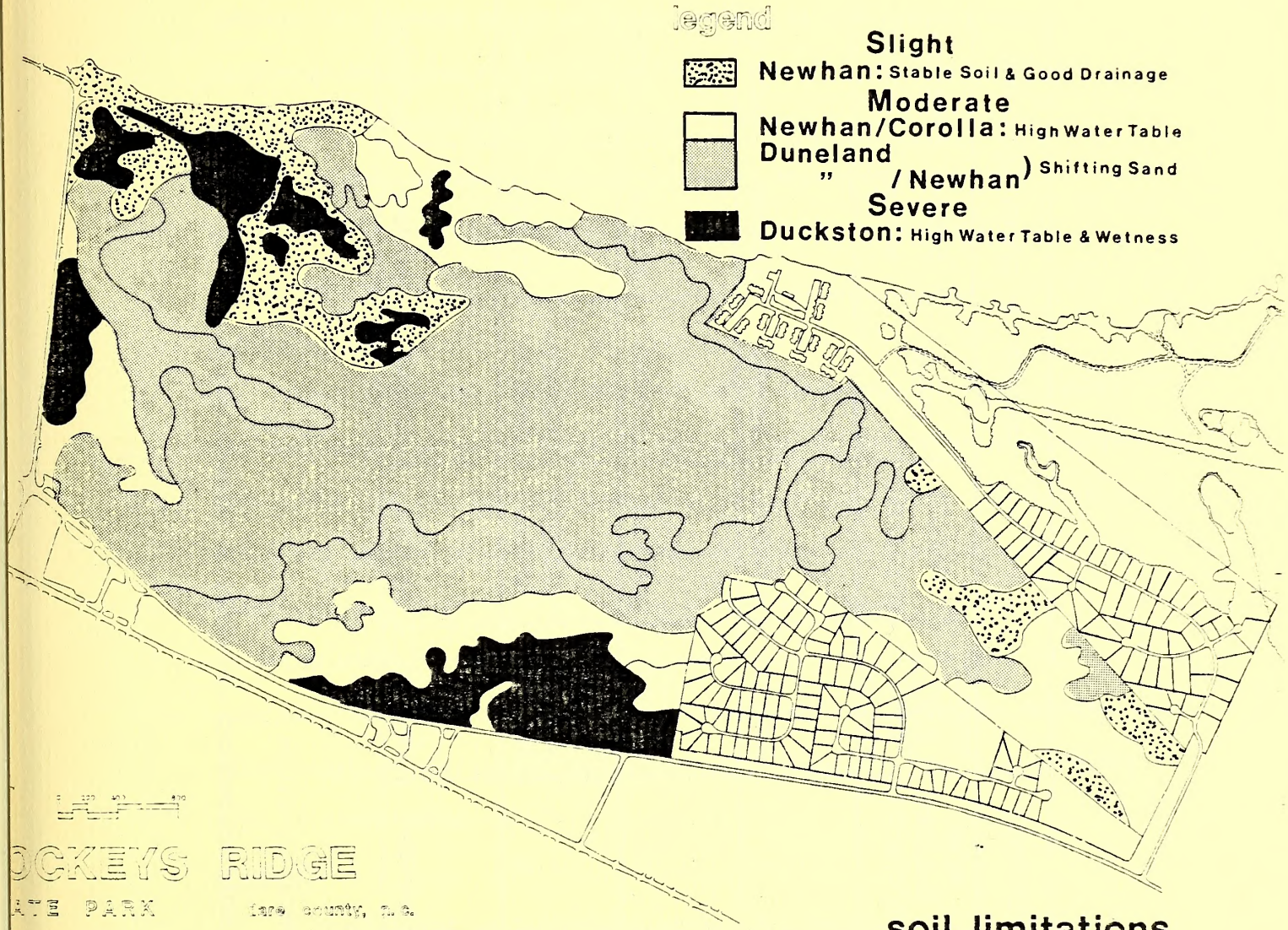
As mentioned earlier, the STAF has been situated by a Dare County Health officer, so that the chance of STAF malfunction is minimal, but nonetheless, this malfunction is possible.

D. SOILS

There are seven different soil classifications present in the immediate vicinity of Jockey's Ridge: four distinct soil units and three soil complexes composed of varying amounts of the four soil units. The soils are all sandy in nature, and the limitations imposed by the soils for development are related both to the permeability of the sands and to the amount of stabilizing vegetation present. Please note the soil limitations map on the next page for the location of the following soils, and page 37 for a chart illustrating the characteristics and limitations of these soils:

NEWHAN FINE SAND

The only soil type identified as having good potential for development, these soils are deep, well-drained and excessively drained, and have a surface slope ranging from 2 to 30 percent. The permanent water table and seasonal high water table are well below 91 centimeters (36 inches) and are generally greater than 1.8 meters (6 feet). These soils have more than 40 percent of the surface vegetated and are considered to be fairly well stabilized.



OCKEYS RIDGE

ATE PARK dare county, n.c.

soil limitations

SOIL TYPE	CHARACTERISTICS		DEGREE OF LIMITATION FOR:						
	NATURAL FERTILITY	WIND EROSION POTENTIAL	SEPTIC TANK ABSORP-TION FIELDS	SMALL BUILDINGS	ROADS	CAMP-SITES	PICNIC AREAS	PLAY AREAS	PATHS & TRAILS
COROLLA	LOW	1	SEVERE	SEVERE	SEVERE	SEVERE	SEVERE	SEVERE	SEVERE
DUCKSTON	LOW	1	SEVERE	SEVERE	SEVERE	SEVERE	SEVERE	SEVERE	SEVERE
NEWHAN	LOW	1	SLIGHT-SEVERE*	SLIGHT-SEVERE*	SLIGHT-SEVERE*	SEVERE	SEVERE	SEVERE	SEVERE
DUNELAND	LOW	SEVERE	SEVERE	SEVERE	SEVERE	SEVERE	SEVERE	SEVERE	SEVERE

* - Dependent on slope

1 - Dependent on amount of surface vegetation

COROLLA SAND

These soils are moderately well and somewhat poorly drained soils. The permanent water table and seasonal high water table range from 46-76 centimeters (18-30 inches) below the surface. Corolla Soils are generally well stabilized, and some areas may exhibit the wetness which is characterized by the series, but lack vegetation due to rapidly shifting sands or previous outwash effects. The Corolla Soils' wetness limiting factor indicates a fair to poor potential for development, with a considerable potential for septic system malfunction and/or contamination of the ground water.

DUCKSTON SAND

These soils are poorly drained, with the permanent water table and seasonal high water table at the surface or within 46 centimeters (18 inches) of the surface throughout most of the years. Duckston soils are generally well stabilized, but like the Corolla soils, some areas may lack vegetation due to the effects of rapidly shifting sands or outwash effects. Duckston soils have poor to very poor potential for development (the limiting factor is wetness, with a high potential for septic system malfunction and/or contamination of ground waters.

DUNELAND

A generalized soil classification, but nonetheless, Duneland is very descriptive. It consists of the deep, excessively drained areas of shifting sands. Less than 15 percent of the surface is vegetated; and small areas of Corolla, Duckston, and Newhan soils can be found within this mapping unit.

NEWHAN-COROLLA COMPLEX

This is a major soil combination in the Jockey's Ridge vicinity. This complex consists of approximately 50 percent Newhan soils, and 35 percent Corolla soils on slopes less than 30 percent. Both of the soils within this mapping unit have the characteristics and interpretations as discussed for the individual units previously. Small areas of Duckston soils may also be included in this mapping unit, as well as small areas which have less than 40 percent surface vegetation.

COROLLA-DUCKSTON COMPLEX

This complex consists of approximately 55 percent Corolla soils and 40 percent Duckston soils. The soils within this mapping unit have the same characteristics and interpretations as the individual units.

DUNELAND-NEWHAN COMPLEX

Newhan Soils have more than 40 percent of the surface vegetated, and Duneland is sparsely vegetated, so the major consideration for soils in this mapping unit is the lack of stabilizing vegetation. There is a high potential for shifting sands which can result in the undermining or covering of roads and structures.

IMPACT OF PROPOSED FACILITIES ON SOILS

INTERIM FACILITIES

Regardless of the magnitude or importance, the proposed facilities will impact soil resources to a certain degree. Due to the fact that the type, age, quantity, quality, and spatial distribution of stabilizing vegetation plays such an important role in soil conditions in a coastal ecosystem, only those proposed actions requiring no vegetation removal will be discussed in this section. Those proposed actions impacting soil

resources and requiring vegetation removal will be discussed in the vegetation section (which thus will permit a more comprehensive discussion of the vegetation/soil relationship impacts).

Therefore, the only interim facilities which falls into this category is the water line from the Bypass to the toilet building and the sewer line to the septic tank absorption field. Conscientious alignment of this water line and sewer line will not require any vegetation removal or disturbance, and will result in a short-term,insignificant soil disturbance.

PHASE I FACILITIES

As with the water line and sewer line in the interim phase, the Phase I water lines to the park office/maintenance building and to the park residence and sewer lines to the STAF will create only a short-term soil disturbance. The placement of the park residence and driveway in the existing sub-standard residential area [which will require the removal of the existing buildings] will result in the creation of small amounts of impermeable surface, and some permanent soil compaction. However, the net quantity will be less than currently exists. The placement of picnic shelters and tables will restrict the free movement of the shifting sands.

PHASE II FACILITIES

The construction of another park residence, additional water and sewer lines (to and from the visitor center), additional picnic shelters, and the underground placement of existing utility lines will create similar impacts as previously discussed.

E. FLORA

Five major plant communities have been identified within the Jockey's Ridge area. Much of the variation within and between these community types is related to the wind/ocean effects and the types of aquatic regimes within the area.

DUNE COMMUNITY

The plant species associated with the beach/front dune complex are generally tolerant to salt spray. However, the major dune, Jockey's Ridge is virtually devoid of vegetation. Whether this situation is related to the unrestricted use of the dune, wind relations with respect to surrounding development and natural features, or is simply related to the general instability of such a large dune has not been successfully determined. The presence of some small amounts of beach grass and sea oats on the lesser slopes of the dunes, and similar dune relationships at Bear Island indicates that the general absence of vegetation on the greater slopes of Jockey's Ridge is related to the dunes's size, and past and present human impacts. Representative species of the Dune Community include:

Uniola paniculata	Sea Oats
Andropogon littorailis	Little Bluestem
A. glomeratus	Beard Grass
Cenchrus pauciflorus	Sandspurs
C. tribuloides	Sandspurs
Eragrostis spectabilis	Lovegrass
Muhlenbergia endentula	
Croton punctatus	
Erigeron pusillus	
Euphorbia polygoniflora	
Hydrocotyle umbellata	Marsh Pennywort

SHRUB COMMUNITY

Shrub communities are formed within pockets protected from wind carried salt spray. These communities, while present, are not as extensive as in some areas of the Outer Banks. Also, to some extent at Jockey's Ridge, this community acts as a transitionary community between the Dune and Pine-Hardwood community types.

Representative species of the Shrub Community include:

Quercus virginiana	Live Oak
Juniperus virginiana	Red Cedar
Myrica cerifera	Way Myrtle
Ilex vomatoria	Yaupon
Rhus copallina	Dwarf Sumac
Persea borbonia	Red Bay
Magnolia virginiana	Sweet Bay
Callicarpa americana	French Mulberry
Ampelopsis arborea	Pepper Vine
Parthenocissus quinquefolia	Virginia Creeper
Rhus radicans	Poison Ivy

PINE-HARDWOOD COMMUNITIES

This rather unusual coastal-barrier plant community can be found in the sheltered area behind Jockey's Ridge. The presence of such a community type illustrates the significant reduction action of salt-spray by the high dune. Because of the unusual nature of these communities at Nags Head, they are believed to be relics of forests that occurred here during the Pleistocene, when the ocean was at its lowest known level.

Representative species of the Pine-Hardwood Communities include:

Pinus Taeda	Loblolly Pine
Carya sp.	Hickory
Quercus falcata	Southern Red Oak
Q. virginiana	Live Oak
Liquidambar styraciflua	Sweetgum
Juniperus virginiana	Red Cedar
Carpinus caroliniana	Iron Wood
Cornus florida	Dogwood
Sassafras albidum	Sassafras
Magnolia virginiana	Sweet Bay
Persea borbonia	Red Bay

TIDAL MARSH COMMUNITIES

There are two distinct marsh phases on the sound side of the barrier, both of which are directly related to the amplitude of salt water tides. The hydric phase is found within the forces of tides, whereas the zeric phase is found outside such influence. The climax direction of most tidal marsh communities appears to be from xeric to hydric, followed by shrub communities related to salinity content. Some of the representative species of the two Tidal Marsh Community phases include:

XERIC

Distichlis spilata	Salt Grass
Elymus virginicus	Wildrye Grass
Spartina alterniflora	Cord Grass
S. patens	Cord Grass
Juncus roemerianus	
Myrica cerifera	Wax Myrtle

HYDRIC

Thelypteris palustris	Marsh fern
Typha angustifolia	Narrow Leaved Cattail
T. domingensis	Cattail
Triglochin striata	Arrow Grass
Sagittaria falcata	Arrowhead
Echinochloa walteri	

DISTURBANCE COMMUNITIES

With the advent of human ingress and habitation, some disturbance communities have resulted. Old habitation sites and areas of cultivation are undergoing a different successional route. Within this succession of disturbance communities, plants that have been artificially introduced into the island system (some forming atypical associations with the normal ecological community representatives) are often found. Some of the representative species in the Disturbance Communities include:

Yucca spp.	
Potamogeton pectinatus	Pondweed
Phlox drummondii	
Coreopsis lanceolata	
Petunia violacea	
Centaurea cyanus	
Canna indica	Canna
Lantana camara	
Papaver somniferum	Poppy
Oxalis martiana	

Although no rare or endangered plant species have of yet been identified at Jockey's Ridge, a memorandum from A.E. Radford, Professor of Botany at UNC-CH, described the following unique flora at nearby Nags Head Woods Area (for which some of the species may exist at Jockey's Ridge):

*Actual northern limit for Habenaria repens (Green orchid)

*Actual southern limit for Hudsonia tomentosa (a northern sandbinder)

*Transition area for dune scrub and sand-binding herbs: live oak, yaupon holly and Chrysopsis gossypina - southern species - being replaced by northern bayberry (Myrica pennsylvanica) and Hudsonia tomentosa.

*Transition area between live oak, laurel oak and mixed oak forests

*Transition area between cove hardwood forest, swamp forest, and bay forest elements

*Transition area between salt marsh shrub and bay shrub communities

*Only extent pools remaining in North Carolina for all genera of duckweeds - Wolffia, Wolffiella, Lemna, and Spirodela

* Taxonomically and evolutionarily significant hybrid oak populations

*Unusually large specimens of American holly, sweet bay, flowering dogwood, hercules club, and hop hornbean.

*Excellent species, community and habitat diversity; one of the best areas, if not the best, for diversity on any barrier island in the Carolinas.

The planning implications as deduced from this section should be obvious. Although the actual flora biomass at Jockey's Ridge is small,

there does exist a situation of tremendous species and trophic diversity and complexity. Furthermore, the inter-dependence of vegetative associations on barrier islands has been well documented. The presence of these inter-related and interdependent community types is known to prevent breaches, reduce damage to the highly productive tidal marsh, and reduce damage to inland development during hurricanes and other severe storms. Conversely, in similar developed areas, loss of natural communities has been shown to increase damage to the inland developments, the productive tidal marsh, and frequently results in the island being breached by high intensity storms.

Therefore, it is of the utmost importance that the caretaker of the island, the vegetation, be protected and preserved from unnecessary development and uncontrolled outdoor recreation use.

IMPACT OF PROPOSED ACTION ON FLORA

INTERIM FACILITIES

In order to permit the construction of the parking lot/park office area, approximately 0.82 hectares (2.04 acres) of vegetation will be removed. Although the design utilizes the cleared areas created by subdivision road clearing in the past, the area is not large enough for all of the proposed facilities. (note, due to the Health Department site specific placement of the septic tank absorption field in the southern road clearing, the parking design was changed, which ultimately will require additional vegetation clearing).

The interim facilities that will change the vegetation/soil balance are: the 100-car parking lot (the southern bay will have virtually no impact, whereas the northern bay will require vegetation removal), vehicle shelter and storage buildings, the main septic tank absorption field, and the toilet building. The vegetation/soil impacts that will result from

this development fall into two main categories:

1. The parking lot and buildings will result in site specific soil compaction; the vegetation clearing will change the wind/soil relation (in areas preventing free movement, and others encouraging increased soil movement); and as a long term result of these changes, park facilities will experience some additional soil depostion/removal problems (than would otherwise occur if the vegetation were not removed). Furthermore, the removal of vegetation will upset the existing delicate balances concerning soil stabilization in the immediate area. However, in view of the necessity of the facilities, and the lack of any environmentally sounder location, the adverse impacts can be minimized through vegetation buffer plantings around this day use area. Specific attention must be paid to the area southeast of the development area. Such plantings will eventually counteract the damage in the vegetation/soil/wind relationships created by initial development.

2. The second major category, and the least important of the two deals with the development of the septic tank absorption field. This field will require some vegetation removal, thus adding to the soil movement problems previously mentioned. Also, (and not discussed in the soils section) the STAF will significantly change the soil chemistry in the immediate area. While this impact on soils is not significant in itself, the increased fertility will benefit the remaining vegetation in the immediate area.

PHASE I FACILITIES

The Phase I facilities that will impact the vegetation/soil relationships are: the park office/maintenance building, the driveway to the park residence (the residence itself will be built in an existing building site area) and the four picnic shelters. In view of the important role vegetation plays in a coastal ecosystem, the driveway to the park residence should be redesigned so as to make use of the existing cleared road corridor it passes across. This alignment would require considerably less vegetation removal, a shorter alignment, with no corresponding increase in aesthetic damage or management problems. In view of the noticeably small amount of existing vegetation in the park, the unnecessary additional removal is both ecologically and aesthetically foolish.

The construction of the park office/maintenance area building will require the creation of a cleared corridor between the two existing cleared roadways. While the vegetation loss may be considered justified in view of the absence of a better (management and aesthetically better) site, the vegetation loss will add to wind/soil movement problems. However, due to prevailing wind directions and the remaining vegetation buffer, this building development should not create serious long term problems. Finally, the clearing of vegetation for the picnic shelters must be kept at a minimum; while existing open space utilization maximized.

PHASE II FACILITIES

The phase II facilities that will affect vegetation/ soil/wind relationships are: the addition of 50 spaces to the parking lot, construction of the visitor center, and the addition of several picnic shelters. The parking lot addition will require increased vegetation removal, thus

compounding the soil erosion problems created by earlier development. The actual soil movement can be minimized by vegetation buffer planting on the upwind and downwind sides of the parking lot area. The visitor center will require some vegetation removal, which will result in similar problems as related to the park office. Some redesign is recommended so as to utilize existing open space more fully. Finally, the addition of more picnic shelters will result in additional vegetation removal. This removal though must be maintained at a minimum.

In conclusion, through vigilant revegetation efforts, soil/wind problems created during construction can be minimized. At the present, the facility design does not fully utilize existing open space. Through additional design practices and resultant minimal facility realignment, future ecological and maintenance problems can be avoided.

F. FAUNA

Due to the fact that no data was available with respect to local animal populations, the presence of species in the Jockey's Ridge area has been analyzed through probabilistic means, and thus, is hypothetical. The extensive successional development of Nags Head Woods should correspond to a concurrent diversity of animal species. The tidal-marsh, shrub and beach dune communities should be theoretically similar to other barrier island communities. The pine-oak-hickory community presents a somewhat unique situation in need of further study. The presence of this community type should naturally increase, rather than decrease diversity, and would probably cause inclusion of additional species not normally associated with the Outer Banks. The following listing of probably occurring wildlife at Jockey's Ridge State Park, as compiled by the former N.C. State Park Regional

Naturalist, is most likely somewhat optimistic due to the relatively small amount of habitat, and the large amount of human intervention in the area:

SPECIES	# of POSSIBLY OCCURRING	# of POSSIBLY OCCURRING
Turtles	15	
Lizards	9	
Snakes	29	
Salamanders	16	
Frogs and Toads	20	
Birds	277	29
Mammals	6	

Due to the aforementioned lack of wildlife research at Jockey's Ridge, no Rare or Endangered fauna have been identified. Furthermore, the lack of vegetation, and the tremendous use pressures at the Park preclude the possibility of rare or endangered fauna existing in the Park (hypothesis supported by the N.C. Natural Heritage Program).

Nonetheless, prior to construction, development areas will be studied by qualified personnel so as to avoid any damage to rare or endangered plants or animals that may exist there. Existing vegetation at Jockey's Ridge can be observed in the Existing Uses Map on page62 .

IMPACT OF PROPOSED FACILITIES ON FAUNA

It is highly improbable that any of proposed facilities will adversely impact faunal resources. The vegetation removal may destroy some bird habitat, but via conscientious revegetation efforts this impact can be maintained at a minimum (via biomass addition and variation). At this writing, there will be no impact on rare or endangered fauna.

G. GEOLOGY

The Outer Banks originated, in its present form, as a result of the last glaciation. Prior to glaciation, the sea level was approximately 7.6 meters(25 feet) higher than at present. As the glacier formed and moved southward, sea level dropped about 91 meters (300 feet) along the Outer Banks. At full glacial time, a continuous coastal plain was exposed from Florida to Cape Cod. Along present day North Carolina, this shelf was 145 kilometers (90 miles) wide; and as the ice melted, the sea level rose and flooded what is now known as the Continental Shelf. The greater part of the Outer Banks was created during this post by local erosion of sediments by onshore waves.

Exploratory wells penetrated six significant hydrogeologic units above a depth of 152 meters (500 feet) at Kitty Hawk. These units include three aquifers and three confining beds or aquitards. The Geology and Groundwater on Bodie Island illustration on page 29 serves to accurately and simplistically display the location and composition of these various units.

According to the N.C. Department of Natural Resources and Community Development, Division of Earth Resources, Mineral Resources Section, there are no commercially important mineral deposits in the Jockey's Ridge State Park region. (N.C. DNER, 1976)

IMPACT OF THE PROPOSED FACILITIES ON GEOLOGY

It is highly improbable that any of the proposed facilities will have any impact on the geological resources of Jockey's Ridge State Park.

H. Historical Resources

The Jockey's Ridge State Park region is rich in historical resources. The Ridge itself is listed in the National Registry of National Landmarks, and along with the nearby Wright Brother's Memorial, Fort Raleigh National Historic Site, and Cape Hatteras National Seashore, the region has a high potential for historic/ recreation interpretation opportunities.

Archeological surveys of the park area by Haage (1958), Phelps (1972), and Simpson (1976) have identified two sites within the park as possibly archeologically significant. The first site, a concentration of shell middens, is located 457 meters (1500 feet) south of due west from the Nags Header Hotel. However, due to past residential construction activities and the constantly shifting sands, the significance (and possibly the existence) of this site is questionable.

The second site is located between the Ridge and the Sound, near the leading edge of the Ridge. Consisting of 18th and 19th Century house ruins, shell middens, and one chard, this site is considered significant, and worthy of protection. Prior to the development of the ranger's residence and overflow parking lot in this area, the site should be re-surveyed by a professional archeologist in order to determine the exact location and condition of the site.

These two sites are currently covered by sand, and their exact location is unknown. Please note the Appendix for additional data.

IMPACT OF THE PROPOSED FACILITIES ON HISTORICAL RESOURCES

If the sound side archeological site is resurveyed as recommended, and an appropriate site determined for the park residence and overflow parking lot, then none of the proposed actions will have an adverse affect on any sites listed on the National Register, nor any sites of State or local significance.

Hang gliding and other proposed recreational uses of the Ridge should not adversely affect the National Landmark designation of the Ridge, due to the constant natural sand replenishment characteristics of the dune.

I. WILDERNESS

The popular conceptualization of wilderness is large areas of land preserved in its natural state and where there is no evidence of past use by man. Due to the vast visual horizons at Jockey's Ridge State Park, and the tremendous use pressures during the summer months, it would appear that the Park does not have a wilderness character. However, terms used to describe a wilderness, such as bleak, barren, undeveloped, aesthetically beautiful do apply to Jockey's Ridge State Park. The dominant feelings for preservation coupled with the inherently severe development limitations of the Park has created a situation where this barrenness has become extremely discriminatory against several portions of the recreation public. This barrenness can then be re-applied to a wilderness type description of Jockey's Ridge State Park in that the area is recreationally undeveloped, and use of the park is limited to certain populations.

The master plan for Jockey's Ridge State Park states in the foreword:

> "The primary objective in preparing a master plan for Jockey's Ridge is to provide a development plan and program compatible with the nature of the site. It is essential that the plan be unified physically and in such a way that administrative services and operations can be provided efficiently. In addition, the master plan speaks to the optimum carrying capacity of the site for all of its proposed activities and facilities with respect to the maintenance of the desired park character..."

IMPACT OF THE FACILITIES ON THE JOCKEY'S RIDGE WILDERNESS

The discussion of the impact of the proposed facilities, divided, and discussed in the three development phases has relatively no meaning in relation to wilderness/barrenness. With each man-made change in the Jockey's Ridge landscape, the impressions derived from that landscape will change. Therefore, efficiency demands a discussion of the terminal and holistic impression upon conclusion of development activities.

Essentially, the existing visual barrenness will remain as it now exists (if not improved). On site garbage will be removed, existing utility lines will be placed underground, several structures will be removed, and the park office area will be vegetatively screened from view from other parts of the Park.

On the other hand, the recreational wilderness/barrenness will likewise be beneficially impacted.

Through facility provision and park maintenance and management, much of the current discrimination the park environment places on the recreation public will be terminated. Upon analysis of the various ecological, social, and recreational impacts associated with the master plan, the objective of facility provision while maintaining park character has been accomplished.

J. PUBLIC SAFETY, WELFARE, EDUCATION, AND HEALTH

(Socioeconomic conditions and impacts)

Nearly 70 percent of all the developed land in Nag's Head is occupied by tourist oriented features, with motels, hotels, restaurants, gift shops, entertainment facilities and gasoline service stations comprising nearly 70 percent of this total. Other than small pockets of permanent residents in south Nags Head, along Danube Street and Hesperides Street between the 158 Bypass and Roanoke Sound, and along Sound Side Road between the Bypass and the Sound, socioeconomic conditions of the region are predominantly tourist oriented. The following table presents some interesting demographic data:

Area	1970 Population	1974 Estimated Population	% Change
Dare County	6,995	9,000	+28.3
Kill Devil Hills	357	460	+28.9
Manteo	547	660	+20.7
Nags Head	414	530	+28.0
Atlantic Township	1,141	1,471	+28.9
Nags Head Township	3,328	4,160	+24.4

(Van Oesen, 1977)

The above population data represents a relatively small part of the total Dare County region when the tremendous influx of seasonal residents and visitors to the area are taken into consideration. Two of the most recent land use and economic base studies of the Dare County Beach Area have incorporated extensive surveys and analyses to determine the total housing available of the Dare County Beach Area in 1972. Data indicates that in 1972 peak population reached 37,000 persons including day visitors during peak holiday periods. An economic base study indicated that there was housing capacity for 29,400 persons on the Dare Beaches in 1972. (Von Oesen, 1977)

However, severe inaccuracies can be presented if one were to project the above data specifically to Jockey's Ridge. The socio-economic conditions of any given tourist locale are highly influenced by the factors affecting tourism in any given year; such as climatic conditions, availability and cost of petroleum fuels (and the travel cost in general) and the overall condition of the National economy.

As mentioned, the socio-economic climate of Nag's Head is almost entirely comprised of yearly fluctuating, transient, and mixed tourist or recreation publics. During the summer season, 90 percent of the tourists surveyed at Nags Head traveled 161 kilometers (100 miles) or more to vacation here. Over 12 percent came parts of Virginia, and smaller percentages came from South Carolina, Kentucky, Tennessee, and New Jersey.

On the average, the visitation at nearby Cape Hatteras National Seashore increases from 10-15 percent every year. If this trend continues, Jockey's Ridge can expect approximately 400,000 visitors per year when full time operation begins, and close to 500,000 visitors per year by 1980.

IMPACT OF THE PROPOSED FACILITIES ON SOCIOECONOMIC CONDITIONS

As with the previous Wilderness section, efficiency and logic dictates that attempts to discuss these impacts be directed toward the entire master plan, rather than the customary piece meal/phase procedure.

Many of the social-cultural benefits that will derive from development of Jockey's Ridge State Park are directly related to the provision of facilities and opportunities where none currently exist. The recreation public's safety, welfare and health conditions will benefit drastically merely by providing toilet and water services at the park. At the present, none are available at the park; the demand being handled by nearby businesses. Also, by constructing a parking lot within the park, the existing dangerous roadside pull-off can be eliminated.

Land acquisition, park development, park utilization, and a controlled recreation environment should benefit regional socio-economic conditions. The $2,200 ad valorem tax revenue loss to Dare County (as a result of placing the proposed acquisition of 67 hectares - 165 acres of land into State ownership) will be more than counterbalanced by increased land values and increased tourist spending facilitated by a developed State Park. Through land acquisition, two permanent residents, and six summer families will eventually be displaced, but the People to Preserve Jockey's Ridge have made more than adequately acceptable arrangements to these people for relocation.

Philosophically, land acquisition and park development will have a tremendous beneficial impact on the non-tourist season permanent resident, the partial-year resident, and the recreational public.Combined with the interpretation/education opportunities that will be created at the park, the mere formalization of a State Park in this area assures that this nationally unique site of superb geological, ecological, and recreational conditions will be forever preserved. The psychological benefits derived from this preservation are justifiably unquantifiable.

K. Discrimination

As was mentioned in the previous section, through the serious lack of recreation support systems at Jockey's Ridge State Park, the park in itself is very discriminatory against the aged and handicapped recreational public. The deep, shifting sands and the

lack of water and toilet facilities restrict the aged and handicapped utilization of the park to either a fleeting glance while driving by, or at best, viewing the park from the roadside pull-off. As a result, utilization of the park is enjoyed solely by nearby residents, and the hardy recreationist.

IMPACT OF THE PROPOSED FACILITIES ON DISCRIMINATION

While the proposed facilities will not entirely reverse this current discrimination problem (the deep sands will continue to pose problems for certain populations) they will allow utilization of the park by greater numbers of various population. Parking lots, the toilet building, visitor center, picnic area, and other similar facilities will create a recreational environment utilizable by the aged and handicapped populations where none currently exists.

L. Resource Conservation

Four basic resources are currently being used at Jockey's Ridge State Park.

Water resources, and more specifically, ground water, are not being used on the site per se, but the neighboring businesses are providing for the demand placed by the recreation public.

Scenic resources are enjoyed by the publics using the park. Through increasing regional development, the off-site aesthetics are experiencing continual degradation.

The only energy resources currently being used in the park are wind and human biological energies. Both are considered

renewable, and both will continue to play an important role in the recreation satisfaction obtained in, and from the park.

Finally, the maximum recreational resources of the park are not currently available. These recreational resources or opportunities, while not technically renewable, are in sufficient supply so as to avoid overuse.

IMPACT OF PROPOSED FACILITIES ON RESOURCE CONSERVATION

The principles and objectives of the North Carolina State Park System, which guided the proposed development of Jockey's Ridge State Park, strongly advocate a philosophy which tends to be oriented more toward resource preservation than resource conservation.

The actual development of the proposed facilities will affect resource conservation in the following manners:

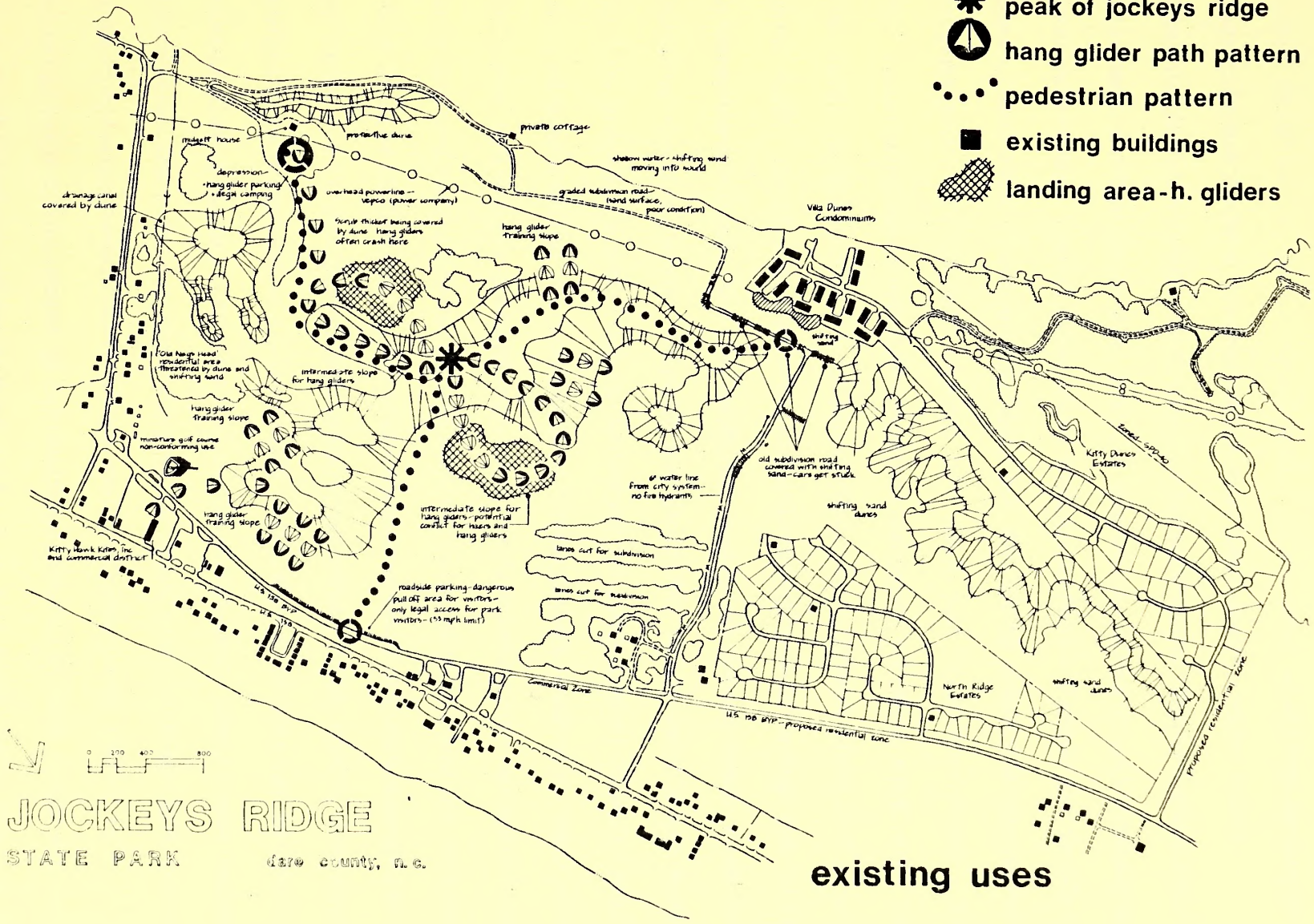
- With the provision of recreational public designed water and toilet facilities, the efficient water use (obtained from the town of Nags Head) will be maximized. Although the quantity utilized will increase periodically, carefully maintained septic tank absorption fields will allow eventual recycling of this water.
- On site scenic resources will be improved via the master plan. Zoning ordinances will prevent conflicting aesthetic situations near the park.

- Through the facility provision advocated by the master plan, wind and human biological energy resources will be utilized in growing quantities. The energy required for park development and maintenance (construction, electrical, telephone, etc.) will be considerably less than if for some reason the park had been developed into residential uses (as had been the trend prior to initial land acquisition). The amount of energy consumed during park construction will be in insignificant amounts.
- Finally, recreational resources will be strengthened in the park, which will allow greater numbers of people to use the park, while permanently maintaining and preserving the ecological and scenic resources that make the park recreationally desirable.

M. Land Use

* Please note the Existing Uses Map on page 62 . *

Since the early 1800's, Bodie Island has been a nationally significant summer resort area. Retarded three times by war and depression, the progressive development of the region has been spurred not only by the unique natural attractiveness of the resource base, but also by the removal of the inherently severe access problems. Through the construction of bridges across Croatan Sound, the Alligator River, and Oregon Inlet, nearly the entire


legend
peak of jockeys ridge
hang glider path pattern
pedestrian pattern
existing buildings
landing area - h. gliders
private cottage
protective dune
midgett house
depression - hang glider parking + illegal camping
overhead powerline — vepco (power company)
drainage canal covered by dune
shallow water - shifting sand moving into sound
graded subdivision road — (sand surface, poor condition)
Villa Dunes Condominiums
scrub thicket being covered by dune hang gliders often crash here
hang glider training slope
intermediate slope for hang gliders
Old Nags Head residential area threatened by dune and shifting sand
hang glider training slope
miniature golf course non-conforming use
hang glider training slope
Kitty Hawk Kites, Inc and commercial district
intermediate slope for hang gliders - potential conflict for hikers and hang gliders
roadside parking - dangerous pull off area for visitors - only legal access for park visitors - (55 mph limit)
US 158 BYP
lines cut for subdivision
lines cut for subdivision
of water line from city system - no fire hydrants
old subdivision road covered with shifting sand - cars get stuck
shifting sand dunes
Kitty Dunes Estates
Commercial Zone
US 158 BYP - proposed residential zone
North Ridge Estates
shifting sand dunes
proposed residential zone
JOCKEYS RIDGE
STATE PARK
dare county, n.c.
existing uses

length of Cape Hatteras National Seashore is easily accessible by motor vehicle.

Since then, Nags Head has experienced a phenomenal surge in both residential and commercial construction. Although mostly residential, a great increase in the construction of commercial and recreational facilities has been realized. Intensive hotel/motel development followed U.S. 158 along the oceanfront; and the construction of the U.S. 158 Bypass opened the back part of the dune area to further residential development.

The area immediately surrounding Jockey's Ridge fell into this category of newly developing residential land. The Town of Nags Head zoned the land residential and four developments were initiated north of Jockey's Ridge. Vista Harbour was the development that began to encroach around the northern end of the dune. Before development was halted, a spine road for the subdivision was constructed from the entrance off the U.S. 158 Bypass to the back side of the Ridge. Several summer and permanent residences are located between Vista Harbour and the U.S. 158 Bypass. State Park land surrounds the property, and access is provided by the Vista Harbour entrance. A 15-centimeter (6-inch) water line that connects with the town water supply was installed along the subdivision road during the period of road construction.

The Villa Dune Condominium project was also constructed on the northern end of Jockey's Ridge. Fifteen multi-family units, an access road from the U.S. 158 Bypass, and a wastewater treatment plant were constructed.

Along the access road to the Villa Dunes, a subdivision named Kitty Dune Estates is being developed. Lots have been subdivided for sale, and water and electrical power are available.

The remaining residential development, North Ridge Estates, also has residential lots for sale. The roads are paved, utilities provided, and three homes have been constructed. Access is from the Bypass, and the western boundary of the development borders Park property.

The remaining development around the Ridge consists of a strip commercial zone along the Bypass and an old residential area (Old Nags Head) to the south. The strip development along the Bypass that is adjacent to the Park is composed of several commercial establishments, a gasoline station, a miniature golf course, and a small number of single-family cottages. The hamburger stand at the intersection of the Bypass and S.R. 1221, and the adjacent miniature golf course are non-conforming uses in the Nags Head SPD-20 zoning classification for this area. SPD-20 is a special planning district intended for low-density planned unit residential development, providing open space and recreational uses in sections not suitable for residential uses. This classification expressly prohibits commercial and industrial uses of the land, and was designed to preserve unique natural phenomena including sand dunes, coastal forests, and other natural features of environmental concern. State Park land is included in this classification.

Old Nags Head is one of the oldest residential areas on Bodie Island. It is located on S.R. 1221, locally known as the Old Sound Side Road. It ran behind Jockey's Ridge through the Sound side of Nags Head Woods to an old fishing village which has since been abandoned. The homes along S.R. 1221 were originally protected from Jockey's Ridge by a coastal forest; however, through the years, the Ridge's southwesterly movement has reduced the size and quality of the forest to a shrub thicket.

Though the Ridge was actually owned by private landowners, it has always been considered part of the public domain. Vacationers and beach residents continue to enjoy the Ridge as others have for centuries. On a calm summer day, it is not uncommon to see hundreds of people climbing to the summit. During periods of its recent history, the Ridge has been subjected to various recreational fads. Jeep races on the lower elevations of the Dune were popular in the 1950's. Parachutists have occassionally used the Ridge as a target for their jumps, and model plane soaring enthusiasts still launch their planes from the peak of the Ridge. The newest and one of the most interesting sports to use Jockey's Ridge is hang gliding. This activity relies on the persistent southwestern and northeastern winds that characterize the area.

Please note the access map on page 24 for the location of regional historic sites.

IMPACT OF THE PROPOSED FACILITIES ON LAND USE

As can be noted in the Environmental Assessment for land acquisition at Jockey's Ridge State Park, of the two dominant Park activities, land acquisition and park development, land acquisition creates the primary impact on regional land uses. This impact, however, is negligible due to two important factors. First, due to the SPD-20 zoning of the area, commercial and industrial development of the land is prohibited. Furthermore, due to the topography, soils, and elevation of the Park, the land base is not suitable for residential development. Therefore, the Park cannot displace other land uses because they aren't eligible to use this piece of land in the first place. Second, the willingness of the land owners to sell or trade their land to the People to Preserve Jockey's Ridge and the State of North Carolina clearly illustrates their (the landowners) desire to preserve the land base as it is. Therefore, in view of this desire for preservation, residential development if it were possible would not be allowed by the landowners.

As noted earlier, the dominant regional land uses are residential and commercial in nature. Residential development patterns are firmly stabilized in this region, so land acquisition and development of the park should not inordinately induce residential development to the area, nor will it retard it. Regional commercial land uses are also well established. Park development will induce increased tourist spending in the area, but the quantity most likely will not encourage new commercial development due to the existing

magnitude of that development.

N. Miscellaneous Resource Information

1. Climate

Cape Hatteras, with its maritime climate, is cooler in the summer and warmer in winter than the mainland. Summer temperatures normally average about 29° C (85°F), and the yearly average temperature is 16.5°C (61.7°F). Temperatures above 32°C (90°F) are rare. The average date for the first occurrence of temperatures as low as 0°C (32°F) is December 5. The average date of latest occurrence if February 25.

The average rainfall at Cape Hatteras is greater than for other North Carolina coastal stations, due to heavy and prolonged rains associated with offshore storms. Rainfall is evenly distributed throughout the year reaching a maximum of about 15.2 centimeters (6 inches) per month in July, August, and September. Normal yearly precipitation totals about 139.7 centimeters (55 inches) on the average. Snowfall is rare and is usually light in amount, melting as it falls.

The prevailing winds at Nags Head are southwesterly, but examination of the wind records indicates the wind directions are approximately balanced. The six months between March and August show southwesterly winds, while the remaining six months (September through February) have northeasterly winds of the same velocity.

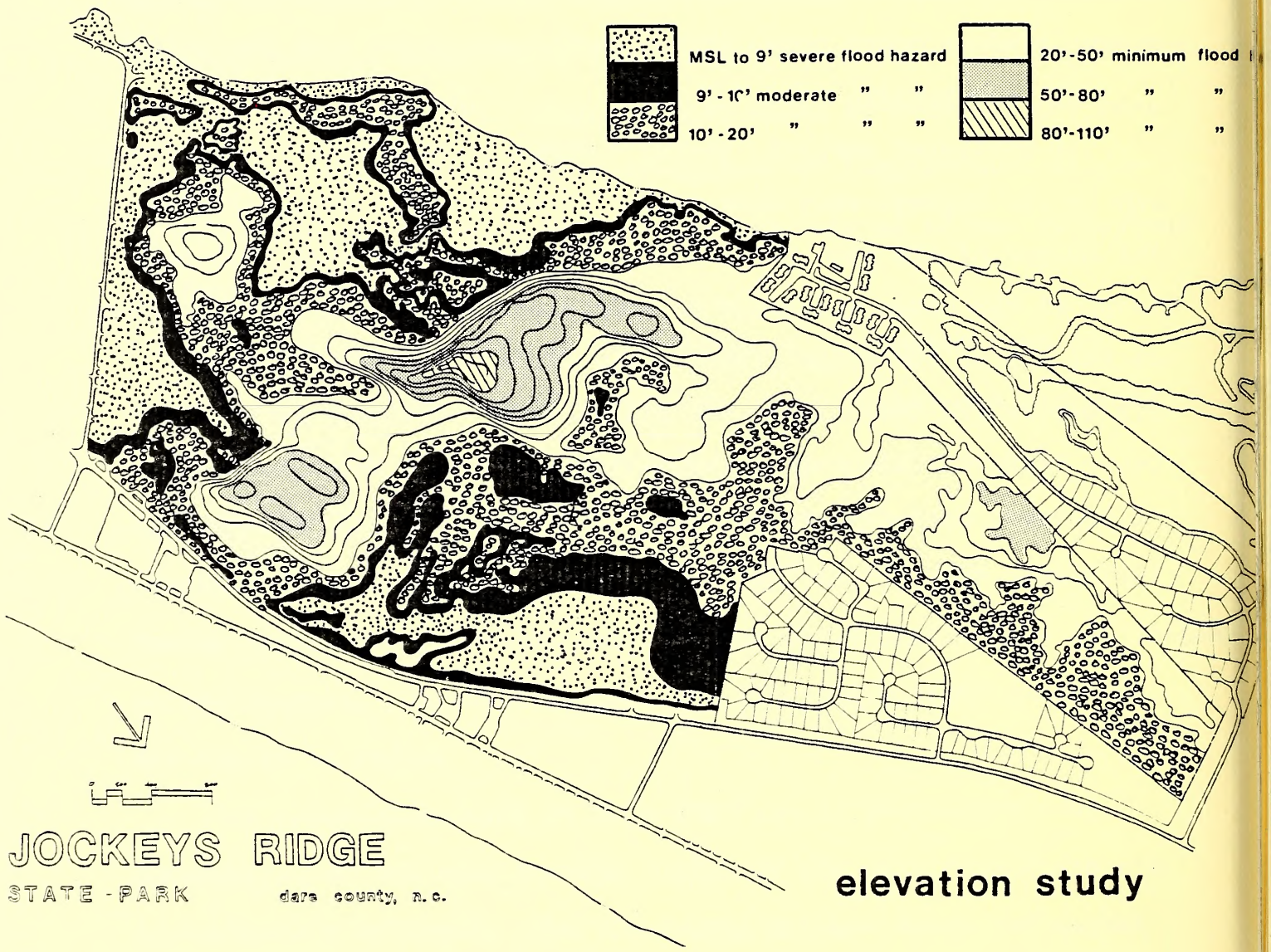
The Gulf Stream passes offshore at a distance of 32-80 kilometers (20-50 miles) from Cape Hatteras. In winter, the southern-

most penetration of the Labrador Current is near the Cape, making the waters off Cape Hatteras the breeding area for storms. These storms usually move north before reaching full maturity, venting their fury on the North Atlantic Coast, while only mildly affecting the Hatteras area. Tropical storms moving up the Atlantic Coast occasionally pass within a few kilometers of Cape Hatteras. These storms produce heavy rain, strong winds, and tides over the island.

2. Topography

As mentioned earlier, Jockey's Ridge is an active dune system, and is the highest such dune system in the eastern United States. The height of the land surface at Jockey's Ridge ranges from sea level at the ocean and sound to approximately 33.5 meters (110 feet) at the top of the ridge itself. The average elevation is only 6.1 meters (20 feet) above MSL at the most, with much of the Outer Banks in that region below that elevation.

Please note the map on page 70 for additional elevation and topography data for Jockey's Ridge State Park.



elevation study

SECTION IV. OTHER NEPA, SEPA, AND BOR REQUIREMENTS

A. Alternatives to the Proposed Action and their Impacts

There are three primary alternatives to the proposed land acquisition and development at Jockey's Ridge State Park: no further land acquisition and no development (no action), no further land acquisition and proposed development on the existing land, and proposed land acquisition with no development. Let us consider each of these alternatives in view of their associated impacts.

1. No Action: This alternative would necessitate the termination of all acquisition, planning and development proposals for the park. As such, therefore, this alternative would create the largest net negative impact per unit of benefit. As was stated in the environmental assessment for the park: "...man's past development and habitation patterns in coastal environments provide us with with a more than adequate insight into the nature of the future environment of the Jockey's Ridge State Park area without implementation of the proposed action. Often in man's quest for a taste of the good life, he oftens destroys the quality environments which drew him to reside in the first place. So is the case at Jockey's Ridge. Due to the dedicated efforts of a few individuals, development (as was mentioned in the land use section) encroaching on the park, and in fact, the bulldozer grading an area at the base of Jockey's Ridge was stopped.

There can be no doubt in anyone's mind the impact of non-implementation of the proposed action. Although the area currently in State ownership would remain as such, the surrounding land would once again succomb to development pressures. As a result of this development, site specific aesthetics would deteriorate, vegetation destruction would result not only in the loss of a unique and valuable ecosystem, but also would unstabilize the sands.

Without implementation of the master plan, existing problems would increase as the inevitable use pressures increase. Inadequate and non-existing water and sanitary facilities, a dangerous roadside pull-off, a very small, and restrictive carrying capacity due to non-development are but a few of the recreation problems associated with a no action decision at Jockey's Ridge State Park.

2. Proposed Development, No Additional Land Acquisition:

This alternative would alleviate the existing recreation problems at the park, but would result in the same impacts on the land surrounding the park as previously discussed. Through such an alternative, the park entrance road, and the two park residences would have to be redesigned in order to place them on Park property. Any drastic change in the redesign (as would necessarily be advocated with this alternative) would result in a substantial increase in adverse environmental impacts. Furthermore, without the proposed land acquisition, two components of the State Park Principles would be violated. These components state:

"...In the case of State Parks possessing distinctive scenic values and excellent recreational opportunities, every State Park site

shall be of sufficient size to:

- completely include the distinctive scenic features of the area, and if possible, one or more complete landscape units;
- provide sufficient buffer area to protect the distinctive scenic features from outside influences or encroachments..."

3. Proposed Land Acquisition, No Development - while this alternative would prevent the surrounding land problems previously discussed, it would create the identical demand greater than supply situation discussed in the no action alternative. Furthermore, with no development on the land, another component of the State Park Principles would be violated:

> "State Parks possessing distinctive scenic values and excellent opportunities for the development of facilities for active recreational use of natural resources shall receive all development required to protect and preserve the distinctive scenic values, provide public access, protect public health, provide recreational use of natural resources and provide adequate interpretive programs."

Intensive comparative study of these three alternatives, and the proposed action have been completed by State decision makers and various private individuals and groups. The proposed land acquisition/development alternative has been chosen as the most environmentally, socially, recreationally, and economically desirable of the four alternatives.

B. Relationship of the Proposed Action to Land Use Plans and Policies of Federal, State and Local Agencies

Although the relationship of the Jockey's Ridge State Park Master Plan to other plans is somewhat non-existent, three plans warrant some mention. The Statewide Comprehensive Outdoor Recreation Plan (SCORP) indicated that there was a net need of an additional 19,809 hectares (48,948 acres) of BOR Class III (State Park) land in 1976, and 22,358 hectares (55,246 acres) of additional Class III land by 1986 in order to adequately meet projected outdoor recreation demands. The proposed actions at Jockey's Ridge State Park will alleviate some of these needs.

The Master Plan will be in full compliance with the Town of Nags Head zoning ordinances and land use plans. This specific piece of land has been zoned SPD-20. SPD-20 is a special planning district intended for low density planned unit residential development, providing open space and recreational uses. Furthermore, the Land Development Plan for Nags Head, North Carolina states:

"...The obvious advantages in making Jockey's Ridge a State Park are: 1) it is unique (not only in North Carolina, but also in the eastern United States); 2) it is better suited for park and recreation use than for any other use; 3) it would serve to complement the existing National Seashore recreation facilities only a few miles [kilometers] away; ... overall, it would seem that the advantages in establishing Jockey's Ridge as a State Park far outweigh the disadvantages."

(Nags Head Planning Board, 1972)

Finally, due to the environment of, and projected development of Jockey's Ridge, it would appear that the proposed action would be in compliance with the land utilization parameters of the as yet unimplemented N.C. Coastal Area Management Act. There is a high probability that the park may be classified as an Area of Environmental Concern (AEC), and thus limited to open space recreational utilization.

C. Adverse Environmental Effects That Cannot Be Avoided

As a result of implementation of the Jockey's Ridge State Park Master Plan, there will be several adverse environmental effects that can not be mitigated or avoided. For efficiency purposes, these effects will be represented in list form below:

- The removal of approximately 0.82 hectares (2.04 acres) of pine-hardwood community vegetation. Taking place in an area previously partially-cleared by residential construction activities, the amount of vegetation loss will be substantially smaller than if residential construction had continued. Furthermore, prompt revegetation activities in this area will more than compensate for this loss of sand stabilizing vegetation.
- A minute change in soil chemistry via the development of the septic tank absorption field. This impact can be considered short-term, due to plans for the connection with the Town of Nags Head sewage system when it is developed.

- Some changes in the sand movement patterns will occur as a result of construction of the parking lot and park buildings. This change should not affect the movement of, and replenishment of sands near Jockey's Ridge.
- Through formalization of the park (and thus enlarging its carrying capacity) there will be a slightly increased burden on the Town of Nags Head sanitary landfill (due to increased amounts of garbage produced in the park). The increased burden is of an insignificant amount.
- Proposed land acquisition and placement of the land into State ownership will cause Dare County a loss of ad valorem tax revenue of approximately $2,206 per year. In view of the tremendous growth rate of the county, and the revenues derived from increased numbers of spending recreationists , this tax loss can be considered insignificant.
- The proposed actions will displace two permanent residents, and six summer families. However, these people will have been adequately compensated for their losses.
- The eventual acquisition of, and removal of the miniature golf course near the corner of the Bypass and S.R. 1221. This action will result in the removal ofthis type of recreational opportunity from site specific

public consumption. Though perhaps a site specific loss of that form of opportunity, the regional supply of similar enterprises should be sufficient to absorb, if not counteract the loss. However, one must remember that the golf course is not only a non-conforming use in the SPD-20 zoning district, but is also a very severe aesthetic distraction with regard to the park.

D. Mitigating Measures Included in the Master Plan

Application of North Carolina State Park Principles, professional master Planning, land acquisition, environmental impact statement preparation, conscientous park development and constant management and maintenance are the dominant mitigating measures to be applied at Jockey's Ridge State Park. Coupled with an environmental impact/demand/appropriations related facility phasing schedule, the very conservative master plan will in itself maintain adverse environmental impacts at a low level, while constantly striving to mitigate those impacts.

As was mentioned in the discussion of a no action alternative, the formalization of a State Park at this site will mitigate if not eliminate several adverse environmental effects that would otherwise occur without acquisition/development. Any future activities on this land base will be in full accordance with State and Federal laws pertaining to air, noise, and water quality, the N.C. Sediment Control Act, and the Federal and

State Coastal Zone Management Acts (as is exemplified by the redesign and relocation of the septic tank absorption field as directed by County Health officials).

Finally, day-by-day maintenance and management practices (as described in the discussion of the master plan) will maintain at a low level any on site and off site adverse environmental impacts created by the recreation public.

E. Irreversible and Irretrievable Commitment of Resources

There will be very few significant irreversible or irretrievable commitments of resources associated with the proposed land acquisition and development at Jockey's Ridge State Park. Due to the very conservative nature of the plans, the State Park Principles directing those plans, and the minimal amount of, and size of proposed development, none of the proposed actions can be termed irreversible. The park as a whole will remain in its natural condition for as far into the future as sensible predictions can go. If public needs and values dramatically change in the future, the near identical (as now exists)land base will exist for whatever use is desired.

The proposed action does not advocate resource extraction, erosion, destruction of archeological, geological, or historic features, destruction of endangered species habitat, or unalterable changes in land use, and thus, places no irreversible or irretrievable commitment on these resources.

The capital expenditure for land acquisition and park development, along with the time invested, may be termed

irretrievable. However, these modest investments are firmly advocated by the N.C. public as a necessary expense for the preservation, conservation, and utilization of an extremely important environmental and recreational resource.

F. Relationship Between the Local Short-Term Use of Man's Environment and the Maintenance and Enhancement of Long-Term Productivity

The proposed land acquisition/development at Jockey's Ridge State Park will conserve and enhance the long-term productivity of the site while providing for the immediate, short-term use of the area. As is true with several of the current Division of Parks and Recreation projects, the immediate and long-range results of the proposed land acquisition should be best described as preservation. Not only will the land base at Jockey's Ridge State Park be protected from adverse use and/or development which would result from non-State ownership, but existing environmental degradation caused by uncontrolled outdoor recreation use of the site will be controlled.

While the proposed development will provide for the needs of the participating recreational public, these facilities will form the support network necessary for short-term utilization of the park while maintaining future (long-term) preservation options. In this way, long-term productivity will be maintained and enhanced while the local short-term use of the site is enriched.

Without immediate implementation of the proposed action, not only would the various properties comprising the acquisition package succomb to use and development pressures in the next few years, but the tremendous recreational demands of the park would go unfulfilled. This would result in the degradation of the local short-term and long-term nationally significant environment of Jockey's Ridge State Park.

G. Consultation and Coordination

Since the summer of 1973, when Carolista Baum and the People to Preserve Jockey's Ridge made their first concerted attempts to "Save Our Sand Dune," many groups, agencies, and individuals have played an important role in the planning processes for Jockey's Ridge State Park.

The public has been continually involved with the park since that monumental summer 1973 day when Carolista Baum halted the bulldozer grading an area at the base of Jockey's Ridge. At that time, a petition collected approximately 25,000 signatures within a few days, illustrating the public support for saving the Dune.

More recently, in order to include the general public in the master planning processes, two public meetings were held on April 7, and May 24, 1976 at the Nags Head Town Hall. The purpose of the meetings was to solicit public response concerning the provision and management of potential uses or activities at Jockey's Ridge State Park. In the future,

the public will continue to have an important voice in the planning, management, and operation activities for and at the Park.

During the master planning and environmental impact statement processes, numerous agencies have either been in direct consultation with the Division of Parks and Recreation, or have provided valuable information and assistance. Some of the principle groups include the USDA Soil Conservation Service, USDI Geological Survey, U.S. Department of Housing and Urban Development, U.S. Department of Commerce, N.C. Department of Natural Resources anc Community Development - Environmental Management Commission, Division of Environmental Management, Division of Earth Resources, Archeology Branch of the N.C. Department of Archives and History, East Carolina University, and many more, too numerous to list.

At this writing, there have been no official evaluations of potential impacts of this prospect by agencies other than the various components of the Division of Parks and Recreation. Nonetheless, many agencies, groups, and individuals are well aware of the potential adverse environmental impacts of a no action alternative.

H. Objections and Controversies

One feature of the planning processes for Jockey's Ridge State Park, which unfortunately has not occurred during the planning for other components of the N.C. State Park System has been the near total absence of controversies and/or objections

associated with the future of the park. Furthermore, no problems of this nature are likely to manifest themselves in the future. There are no unresolved environmental issues or disagreements over impacts.

The common State land acquisition/private landowner problems have not, and probably will not occur, due to the dynamic personality of Carolista Baum and her careful negotiations with private landowners.

The many utilization and development limitations at the park have prohibited the Division of Parks and Recreation from master planning for all possible uses of the park (such as dune buggy driving). Therefore, a small number of people resent the absence of their favorite activity from future plans. The situation is unfortunate, but has probably occurred with every master plan in existence.

Section IV. Summary

Millions of human feet have trudged up to the top of Jockey's Ridge. Millions of juvenile backsides have plowed temporary furrows in its flanks as youngsters slid down its slopes. The place has long been an unofficial site of recreation: the name itself was derived from horse races around the base of the dune and up its slopes.

Aside from the visual deterioration that extensive building development would bring to Jockey's Ridge, why would the very existence of the dune be possibly threatened by extensive construction on its base? Because, answer geologists, the dune is in a constant process of depletion and rebuilding. Sand is blown off the dune by the wind. New sand is brought and deposited. If the wind's access to the dune is blocked to any extent, it is conceivable that the perpetual building process of nature could be defeated by the structures of man, and eventually Jockey's Ridge would melt away.

In strict accordance to the Principles Governing the Establishment, Extension, and Development of the North Carolina State Park System, the master plan for Jockey's Ridge State Park <u>does</u> "speak to the optimum carrying capacity of the site for all of its proposed activities and facilities with respect to the maintenance of the desired park character."

Intensive resource analysis, public input, and program studies have led to the development of a master plan that minimizes adverse environmental impacts while creating a tremendous recreational environment.

Through land acquisition and park development, a few minor adverse environmental impacts will be realized (residential relocation, vegetation removal, soil/wind changes, soil chemistry changes, etc.). However, these impacts are of a short-term nature, and their magnitude is substantially less than if the park area had undergone residential development. Many of the barriers that prevent maximum recreational enjoyment and utilization of the park will be removed.

Through the implementation ot the master plan for Jockey's Ridge, a nationally unique recreational and environmental land base will be forever protected for the benefit and inspiration of the present generation and for generations to come at a very low environmental cost.

SECTION V. DISPOSITION OF ISSUES RAISED DURING THE REVIEW PROCESS

During the review process, the N. C. Department of Cultural Resources made the following comments: (see page 90)

ISSUE: "In terms of archaeological resources, the draft environmental impact statement adequately addresses the concerns of this office."

RESOLUTION: None required.

ISSUE: "The recommendations of Dr. Phelps for an archaeologist to be present during the construction activities in the vicinity of the soundside site and for testing if cultural remains are located should be implemented. After construction of the facilities, please send this office a copy of the archaeologist's report for our information and files.

RESOLUTION: The Division of Parks and Recreation will comply.

The N. C. Department of Administration made the following comments: (see page 91)

ISSUE: "The totals of 300,000 - 500,000 visitors during the season has a chilling effect on the hydrology of the area. It is absolutely necessary that the most stringent water conservation measures be instituted, and that elaborate water management controls be instituted at the earliest possible date.

While nothing at all is said about fishing in the area, this unrestructed tourist use is related to closing shell-fish beds all along the coast. Recycling, controlled land application of sewage plant effluents, minimum water use, and all possible mitigating measures should be used.

These issues have not been addressed, and should be.

RESOLUTION: The 1976 Dare County Complex 201 Facilities Plan (Henry Von Oesen and Associates) more than adequately assesses this situation. As mandated by PL 92-500, the plan analyzed various waste treatment alternatives. Treatment and reuse of waste-water, and land application alternatives were disallowed due to technical, land use, and legal constraints. The final selected alternative for Dare County effluent disposal involves the development of a main interceptor network, a central regional waste-water treatment facility (secondary treatment) and the discharge of the disinfected effluent into the Atlantic Ocean by means of a submarine out fall and diffuser system.

On October 12, 1978, the Division of Parks and Recreation obtained a permit for the discharge of sewage, industrial wastes, or other wastes from the Environmental Management Commission.

This permit allowed the "construction and operation of 6,000 GPD subsurface waste-water treatment facilities consisting of a septic tank, dual alternating siphons, and approximately 1,332 linear feet of 3-foot wide nitrification trench with 6-inch line."

Ultimate planning calls for the hook-up of the park's sewage disposal system with the County's interceptor system, and the eventual abandonment of this nitrification field.

ISSUE: "The visual improvements are positive. However, it is recommended that local residents be notified of the change, and of alternate facilities for their use for quick meals or recreation comparable to miniature golf, for good public relations and complete understanding of what the park's doing, and plans to do, to their way of life."

RESOLUTION: The Division conducted two public meetings, one on April , and on May 24, 1976 at the Nags Head Town Hall. At these meetings, the public was made aware of the issue raised above. Furthermore, by driving along US 158 and the Bypass, the local resident can readily select alternate facilities for quick meals or recreation comparable to miniature golf from the myriad of opportunities available in the region.

ISSUE: "Clarify existing park boundaries and proposed acquisitions on the map on page 7."

RESOLUTION: An updated and clarified map has been substituted for the original map.

ISSUE: "In order to continue the cooperation between town police and rangers in controlling certain activities at the park, would it be possible to work out arrangements deputizing rangers to issue binding citations for non-cooperating visitors to cut down on disorderly behavior and the rare but occasional defiance of ranger suggestions?"

RESOLUTION: It has been the policy of the Division of Parks and Recreation to not deputize park rangers. Park rangers possess adequate means for enforcing park rules and regulations.

ISSUE: "Maintenance and upkeep of the park would be greatly enhanced if only returnable bottles and cans were mandated. With federal parks in the vicinity where this is the case, could we not try it in N. C.? Presumably suitable litter boxes and signs will be provided for the tourists."

RESOLUTION: The issue is of definite merit, and will be considered in future park management planning processes. Suitable litter boxes and signs will be provided for the tourists.

ISSUE: "The use of "x" as a negligible impact when the customary usage of x is positive on page 20 is questioned. A reversal of this x to meaning destructive impact is preferred."

RESOLUTION: The use of "x" is intended as a placement identifier, not an impact quantifier.

ISSUE: "On page 28, Air Resources and some mitigating measures may be needed during construction, which could be addressed. $CaCl_2$ or sprinkling to lay dust, permeable paving, etc.".

RESOLUTION: If construction activities appear to be significantly impacting air resources, the utilization of these mitigating measures will be considered.

ISSUE: "The impact of any septic tank facilities on the ground water and general hydrology of the entire area (listed as "severe limitation" for development) will be so serious that it seems a waste of time to build them for any interim period. We recommend that sewage facilities be built before any more development takes place, or that the "dry toilet" option be exercised in this area, but in no case should septic lines be built, fostering a false sense of security and possibly encouraging more development than the area can handle. No "foot" in the door should be permitted. All water conservation devices from toilets to shower heads, faucets, and other equipment should be used in such an area, and recommended in the EIS".

RESOLUTION: The majority of this issue has been discussed earlier in this section. No septic tank facilities will be developed in the area described as severe limitation for development. With the forthcoming Dare County effluent disposal system and the inevitable connection with the parks sewage system, it is not feasible to contemplate the development of "sewage facilities" at the park. Considering the high quantities of projected use, the capacity of a "dry toilet" option is prohibitive in this case. The septic lines have been permitted by the Environmental Management Commission. There will be no showers at the park. Other water conservation devices may be employed at the park.

ISSUE: "Cutting more vegetation for parking lots and septic lines is undesirable, as indicated indirectly by the statement that the plants stabilize the sand. No septic tanks should be permitted, with attendant overloading and destruction of plant life. Also, instead of wall-to-wall cars in parking lots, some trees should be left (1) for shade for the cars (2) for wind protection of the area and (3) for aesthetic reasons".

RESOLUTION: The N.C. Department of Transportation redesigned the parking lot which resulted in the removal of some trees during construction. Buffer areas between the parking bays can be replanted to prevent the wall-to-wall car affect. Many trees were left undisturbed.

ISSUE: "State support for good environmental planning and implementation will be necessary. Long-term needs should be considered".

RESOLUTION: Long-term needs will be considered during the preparation of the management plan for the park.

ISSUE: "The definite plans for mitigation of unwanted impacts are necessary to evaluate this proposal (page 49). The "additional design practices and resultant minimal facility realignment" should be more definitely spelled out, as a plan, not a possiblility.

RESOLUTION: In so far as there is so little vegetation at the park, mitigation measures will include the on-site supervision of facility placement by a landscape architect so as to avoid any significant vegetation removal.

ISSUE: "Page 52, "impact on fauna". There is little enough habitat, by the map, page 62 that some assessment could be made during the preparation of the EIS. The final EIS should not be considered complete without such adequate assessment".

RESOLUTION: The lack of habitat, the lack of wildlife, the converse situation in nearby Nags Head Woods, and the lack of impact on wildlife resulting from master plan implementation are factors that have led the Division of Parks and Recreation to believe that page 50 contains an adequate assessment.

ISSUE: "Distinguish between mineral and hydrology resources on page 51. The latter will receive severe impact unless the plan is altered to avoid the septic tank option".

RESOLUTION: On the last line on page 51, substitute the word mineral for geological.

ISSUE: "Carefully maintained septic tank fields" will be impossible for a growing population in this already over-populated area without water conservation by all possible means. This matter must be addresse before Nag's Head becomes another Ramapo or Petaluma (California) where population is held steady by (NY) restrictive permit procedures until water and sewage facilities catch up with demand".

RESOLUTION: "Carefully maintained septic fields" refers to Jockey's Ridge State Park, not to Dare County. It is beyond the scope of this EIS to analyze these problems on a regional basis. The reader is urge to consult the Dare County Complex 201 Facilities Plan as prepared by Henry Von Oesen and Associates, Wilmington, N. C.

ISSUE: "What kind of zoning ordinances will prevent conflicting aesthetic situations neat the park? Can they be spelled out more clearly"?

RESOLUTION: The zoning situation is clearly discussed in the Land Use section, pages 61 to 67.

ISSUE: "What kinds of "recreational resources" will be strengthened at the park? Will they be aesthetically pleasing, low energy consuming, environmentally desirable? More hang-gliders? More ORV's? (off road vehicles?) Buildings, etc."?

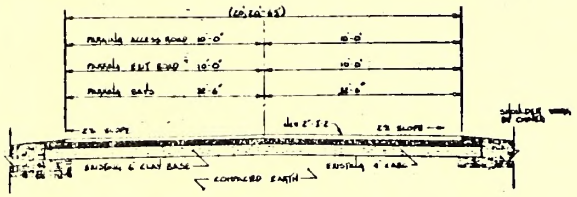
RESOLUTION: Dominant recreation resources/opportunities that will be strengthened include: hiking, bicycling, hang gliding, model plan soaring, picnicing, interpretation, etc. These resources are determined by the Division to be aesthetically pleasing, low energy consuming, and environmentally desirable. Off road vehicles will not be allowed in the park.

ISSUE: "Increased pressures on the Nag's Head landfill" are clearly undesirable and may become disastrous with time. All possible recycling should be mandated, with paper collection, packaging restrictions, reuse and resource recovery mandated to the fullest possible extent. This is an excellent opportunity for newly emerging conservation practices to be realized. The trees to be cut (if it is unavoidable) should be used for chips or firewood-surely not burned, as is now happening in some areas of the state".

RESOLUTION: The Division agrees that the park can offer an excellent conservation practice opportunity, and will comply with the above issue as fully as possible.

ISSUE: "Noted that the archeologist, Dr. Phelps, asked for continuous supervision of the construction activities to see that no important finds go unnoticed in the area, and that work might have to be stopped if anything turns up. This is not mentioned in the work plan. Was it noted"?

RESOLUTION: It was not noted, but this practice is becoming SOP with the Division of Parks and Recreation.



SECTION THRU ROADS AND PARKING BAYS

NORTH CAROLINA DEPARTMENT OF
NATURAL RESOURCES AND COMMUNITY DEVELOPMENT
DIVISION OF PARKS AND RECREATION

JOCKEY'S RIDGE STATE PARK

PAVING PLAN

2

North Carolina
Department of Administration
116 West Jones Street Raleigh 27603

James B. Hunt, Jr., Governor
Joseph W. Grimsley, Secretary

June 22, 1978

Mr. Ozzie Gray
Natural Resources & Community
Development, N. C. Dept. of
Archdale Building
Raleigh, North Carolina

Dear Mr. Gray:

Ref: SCH File #059-78; Draft Environmental Impact Statement for Jockey's Ridge State Park; Nags Head, Dare County

The State Clearinghouse has received and reviewed the above referenced project. As a result of this review, the State Clearinghouse has received from Department of Cultural Resources and Department of Administration the attached memorandums.

Thank you for the opportunity to review the referenced environmental impact statement.

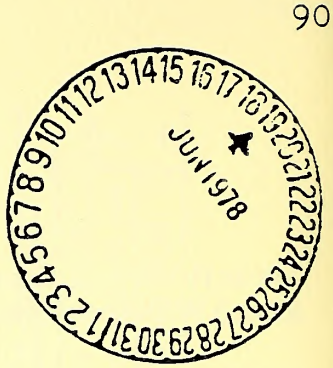
Yours truly,

J. Denny McGuire (Ms)
Clearinghouse Supervisor

/mw

cc: Region "R"

Attachments



NORTH CAROLINA DEPARTMENT OF CULTURAL RESOURCES

Raleigh,
North Carolina
27611

Division of
Archives and History
Larry E. Tise, Director

Sara W. Hodgkins,
Secretary
James B. Hunt, Jr.,
Governor

June 15, 1978

MEMORANDUM

TO: J. Denny McGuire, Supervisor
State Clearinghouse

FROM: Larry E. Tise
State Historic Preservation Officer

SUBJECT: Draft EIS for Jockey's Ridge State Park,
Nags Head, Dare County, CH #059-78

In terms of archeological resources, the draft environmental impact statement adequately addresses the concerns of this office. The recommendations of Dr. Phelps for an archeologist to be present during the construction activities in the vicinity of the soundside site and for testing if cultural remains are located should be implemented. After construction of the facilities, please send this office a copy of the archeologist's report for our information and files.

Thank you for your cooperation and consideration. If you have questions concerning the above comments, please contact Ms. F. Langdon Edmunds, Environmental Review Coordinator, at 733-4763.

LET:slw

cc: Alan Eakes, State Parks, DNRCD

Comments On Jockey's Ridge EIS May 31, 1978 Jane Sharp

1. Congratulations on use of Metric! p. ii

2. Pages 2 & 3. The totals of 300,000 to 500,000 visitors during the season has a chilling effect on the hydrology of the area. It is absolutely necessary that the most stringent water conservation measures be instituted, and that elaborate water management controls be instituted at the earliest possible date.

   While nothing at all is said about fishing in the area, this unrestricted tourist use is related to closing shell-fish beds all along the coast. Recycling, controlled land application of sewage plant effluents, minimum water use, and all other possible mitigating measures should be used.

   These have not been addressed, and should be.

3. Page 6 P3. The visual improvements are positive. However, it is recommended that local residents be notified of the change, and of alternate facilities for their use for quick meals or recreation comparable to miniature golf, for good public relations and complete understanding of what the park is doing, and plans to do, to their way of life.

4. Page 7. Please clarify existing park boundaries and proposed acquisition. The map is not clear.

5. Page 15-16. In order to continue the cooperation between town police and rangers in controlling certain activities at the park, would it be possible to work out arrangements deputizing rangers to issue binding citations for non-cooperating visitors to cut down on disorderly behavior and the rare but occasional defiance of ranger suggestions? This has been requested in conversations between rangers at other parks and visiting members of the Parks Advisory Commission, recently, and seems a time-and energy-saving device for rangers who are usually hard-pressed to keep up with the work load.

6. Page 16. Maintenance and upkeep of the park would be greatly enhanced if only returnable bottles and cans were mandated. With federal parks in the vicinity where this is the case, could we not try it in N.C.? Presumably suitable litter boxes and signs will be provided for the tourists.

7. Page 20. I question the use of "x" as a <u>negligible impact</u> when the customary usage of <u>x is positive</u>. I would prefer a reversal of this to x meaning <u>"destructive impact"</u>.

8. Page 28. Air Resources: and some mitigating measures may be needed during construction, which could be addressed. CaCl2 or sprinkling to lay dust, permeable paving, etc.

9. Pages 28-40. The impact of any septic tank facilities on the ground water and general hydrology of the entire area (listed as "severe limitation" for development) will be so serious that it seems a waste of time to build them for any interim period. We recommend that sewage facilities be built before any more development takes place, or that the "dry toilet" option be exercised in this area, but in no case should septic lines be built, fostering a false sense of security and possibly encouraging more development than the area can handle. No "foot in the door" should be permitted.

   All water conservation devices, from toilets to shower heads, faucets, and other equipment should be used in such an area, and recommended in the EIS.

11. Page 46. Cutting more vegetation for parking lots and septic lines is undesirable, as indicated indirectly by the statement that the plants stabilize the sand. No septic tanks should be permitted, with attendant overloading and destruction of plant life. Also, instead of wall-to-wall cars in parking lots, some trees should be left (1) for shade fo- the cars (2) for wind protection of the area and (3) for aesthetic reasons.

12. Page 46 et al. State support for good environmental planning and implementation will be necessary. Long-term needs should be considered.

13. Page 49 P2. The definite plans for mitigation of unwanted impacts are necessary to evaluate this proposal. The "additional design practices and resultant minimal facility realignment" should be more definitely spelled out -- as a plan, not a possibility -- before the EIS passes muster.

14. Page 52 "impact on fauna". There is little enough habitat, by the map p 62 that some assessment could be made during the preparation of the EIS. The final EIS should not be considered complete without such adequate assessment.

15. Page 51, bottom. Distinguish between mineral and hydrology resources. The latter will receive severe impact unless the plan is altered to avoid the septic tank option.

16. Page 60. "Carefully maintained septic tank fields" will be impossible for a growing population in this already over-populated area without water conservation by all possible means. This matter must be addressed before Nag's Head becomes another Ramapo or Petaluma (California) where population is held steady by (NY) restrictive permit procedures until water and sewage facilities catch up with demand.

17. Page 60, bottom. What kind of zoning ordinances will prevent conflicting aesthetic situations neat the park? Can they be spelled out more clearly? It will be easier now than later!

18. Page 61, middle. What kinds of "recreational resources" will be strengthened at the part? Will they be aesthetically pleasing, low energy consuming, environmentally desirable? More hang-gliders? More ORV's? (off road vehicles?) Buildings, etc.?

19. Page 76 P 2. "increased pressures on the Nag's Head landfill" are clearly undesirable and may become disastrous with time. All possible recycling should be mandated, with paper collection, packaging restrictions, reuse and resource recovery mandated to the fullest possible extent. This is an excellent opportunity for newly emerging conservation practices to be realized. The trees to be cut (if it is unavoidable) should be used for chips or firewood-surely not burned, as is now happening in some areas of the state.

20. Page 95. Noted that the archeologist, Dr. Phelps, asked for continuous supervision of the construction activities to see that no important finds go unnoticed in the area, and that work might have to be stopped if anything turns up. This is not mentioned in the work plan. Was it noted?

Acknowledgements

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-APPENDIX-

An Excerpt from The Archaeology of North Carolina by William C. Haag (1958) Discussing the two archeology sites at Jockey's Ridge State Park

"B 1, Soundside Site.
Latitude: 35° 57' 50"; Longitude: 73° 38' 00" S.L.

B 1 contained no archeological remains of note, but it is an area that reveals something of the geologic processes active in the Banks. The cluster of houses locally known as Soundside lies southwest of Jockey's Ridge, the highest dune along the coast. Directly west of the highest point of the ridge there is but one occupied house now (1955), but one vacant house and at least five sites of former houses may be discerned from piles of shell; broken glass, and other debris, as well as several live oak trees. The remaining resident said his house has been moved from the foot of Jockey's Ridge to its present location. Thirty-five years ago the house had been built near the Sound shore and well away from the sand dune but the westward movement of the dune forced relocation of the house. Unfortunately, the exact spot where the house formerly stood is under the dune edge now but certainly the abandoned house and the other house sites give a clue as to the direction and rate of movement of the dunes. The vacant house is an interesting spectacle. It is two-storied yet sand has drifted entirely around the house, level with the second floor windows. However, wind eddies have kept the house

largely free of sand. Only recently vacating, the occupants had aided the wind by shovelling sand away from the house edges. This house and the abandoned sites are about 800 feet from the Sound shore and all this "free" or "new" land has been formed by sand drifting into the Sound and extending the shore westward.

Jockey's Ridge may be seen during the summer with a plume of sand spilling over the crest of the ridge toward the east. The prevailing summer winds from March to October are southwesterlies, but in winter the wind shifts to the east and northeast and these are stronger, steadier winds, hence, the dunes all tend to move soundward (westward).

Local collectors report sherds from this midden area but could produce none for inspection. One sherd was found on the Sound edge. No other Indian materials were forthcoming. A collection of chinaware, crockery, and glass fragments was made fron the house middens that are gradually being covered by Jockey's Ridge. The time of occupation can be fixed between 1875 to 1925 and historical research may profitably use collections of this nature. It seems obvious that future disclosures of modern chinaware of the eastern side of Jockey's Ridge will give an accurate measure of the rate of its movement.

B 3, Nags Head Site.
Latitude: 35° 59' 00"; Longitude 75° 38' 35" S.L.

Bearing ten degrees south of due west and fifteen hundred feet from the present location of the Nags Header Hotel are six small spots of midden. Each is less than ten feet in diameter and composed mostly of shell. When visited in 1954 only twenty-seven sherds could be found but seventy-five sherds were recovered when the site was visited in 1933 by Drs. Kelly and Porter. Another small collection of forty-five sherds was made some years earlier by the National Park Service.

This site is significant because it may be an example of a former Sound-side Site (on the Sound side of the dunes, that is) which has been uncovered now on the eastern flank of the dunes. It is virtually certain that shell has been hauled away from this site since 1938 for the six remnants are mere heaps of shells that appear to be in situ but were formerly a continuous stratum. Not more than three feet of shell is present in each hillock but sherds were found directly in those.

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Telephone (919) 758-6883

January 30, 1978

Mr. Alan Eakes
Division of State Parks
N. C. Department of Natural and
Economic Resources
Raleigh, North Carolina 27611

Dear Alan:

In response to your telephone request of this afternoon, I have attached a brief description, comments and recommendations for archaeological sites in the Jockey Ridge State Park, Dare County. If you require further aid or information on this, please let me know.

You can obtain copies of my referenced reports by calling Mark Mathis in the Archaeology Branch, Archives and History, and the Sea Grant Publication from the Sea Grant office at N. C. State University.

Sincerely,

David Sutton Phelps
Professor of Anthropology

DSP/pp
Attachment

FEB 3 1978

Comments on Archaeological-Historical Resources in
Jockey Ridge State Park, Dare County, North Carolina

Prepared by: David S. Phelps, Ph.D.
East Carolina University

Recorded Sites in Jockey Ridge State Park

In his 1956 preliminary survey of the North Carolina Coastal area, William Haag observed and recorded one site on the sound side of Jockey Ridge. The site was given the locational name "Soundside" and numbered B1, Haag's temporary number. The official designation in the North Carolina Archaeological Survey is 31 DR 22.

Haag (1958: 34-36) described modern and older historic houses and former house sites being covered by the continual westward shifting of sand from Jockey Ridge, slowly covering the houses and extending the shore of Bodie Island soundward. He also reclaimed one fragment of prehistoric pottery from the shore and was told of other collections from the site. On the basis of these observations he recorded the area as a multi-component (late prehistoric-historic) site.

During the summer of 1972; the East Carolina University Archaeological Field School was conducted on the Outer Banks, operating out of the (then) E.C.U. Marine Lab at Manteo. Part of the training was a re-survey of Haag's recorded sites. 31 DR 22 was field checked in June, 1972, with the result that no houses were observed, having been completely obliterated in the intervening 16 years. Historic earthenware and a few prehistoric sherds were reclaimed from the sound shore west of the ridge.

Haag's comment (1958: 36) that eventually cultural material will be reclaimed on the east side of Jockey Ridge is essentially correct; given sufficient time and continuation of current processes, the dune will continue moving west as do all others on the current Banks Islands.

Cultural Potential of the Soundside Site

Any construction activity on the western side of the Jockey Ridge dune will undoubtedly expose cultural material and, most probably, evidence of contextual cultural activities. The latter may include house foundations, refuse pits, privies, wells and the remains of appurtenant structures for the historic period; shell or organic midden deposits, refuse, burial or other pits might be expected from the prehistoric period. Without an accurate measurement of the dune's westward migration through time, it is impossible to say how deep or how far eastward such deposits might be encountered.

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For both the prehistoric and historic periods, the preferred habitation location (settlements) on Bodie Island was the sound shore; obvious reasons for this were safety from storms, calm harbors, higher elevations, and proximity to food resources in the maritime forests, sound marshes, and the sound itself. Soundside is in relatively close proximity to "Old" Nags Head and historic sites from ca. 1700 AD onward may exist. The prehistoric site may date anytime after 1 AD--our collections are too small to permit phase assignment.

The importance of the sites (prehistoric and historic) lies in the need for further clarification of coastal adaptive strategies, settlement distribution, and the continuity implied from late prehistoric into modern American times.

The following references are provided for further comment on difficulties of survey and survey procedures on the Banks (Phelps 1976:5), the untapped potential of the area (Phelps 1975:77) and sample recommendations for situations similar to Jockey Ridge (Phelps 1977:10).

The ultimate statement is that surface survey in the dune areas of the Outer Banks is never sufficient to determine presence or absence of sites because of the continuing surface modification processes. There is no way to predict where sites may be underneath the sand since there is no formula for the rate of surface change.

Recommendations for Jockey Ridge

Given the known site but unknown size and content, and the exorbitant expense which would be involved in sand removal for archaeological tests, the following procedure seems most feasible:

(1) Careful and continuous observation by a professional archaeologist while any construction is underway to immediately spot any intact cultural remains.

(2) If such remains are encountered, construction must cease while they are evaluated (tests or observations), and proper recovery planned.

(3) Salvage of cultural remains if dictated by their evaluation.

Steps (2) and (3) above will require a delay or work stoppage clause in the construction contractor's agreement to avoid penalizing him for an unforseeable event.

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